THE ROLE OF ANTENATAL INPATIENT CARE IN OBSTETRIC PRACTICE

by

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This thesis has been composed by me and is based on work which is entirely my own.

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ABSTRACT

Antenatal inpatient care effectively began during the First World War as part of a nationwide interest in maternal and child welfare; in Glasgow the Royal Maternity Hospital Antenatal Dispensary opened in 1915 with the simultaneous allocation of six beds for antenatal inpatient care. The criteria for antenatal admission have never been clearly defined and its overall use in clinical practice has never been evaluated. This study therefore examined the use of antenatal inpatient care in a sample of 1302 women being a random one third of the women delivering in Glasgow Royal Maternity Hospital in 1983.

Almost half the women were admitted antenatally on at least one occasion. The majority of these admissions resulted from a relatively small number of current pregnancy complications broadly covered by the four categories of abdominal pain, hypertensive disease, bleeding and suspected poor fetal growth. Common to all these conditions was an apparent difficulty not only of diagnosis but of identifying the severity or probable ultimate severity and thus the degree of risk in any particular situation. Furthermore, women with serious conditions often presented without a history of a preceding mild disorder. Consequently, selection of women for admission did not appear to have a rational basis, subsequent action seemed random and, although no conclusions on outcome can be drawn from a study such as this, there was often no clearly discernible evidence of benefit from admission.

This study, therefore, demonstrates that data describing current practices is required on a larger and wider scale. There is a need for more precise diagnostic and prognostic tests together with epidemiological study of the common pregnancy complications. The efficacy of hospitalisation as a therapeutic measure in these conditions should then be evaluated in prospective randomised controlled trials with due regard to the economic, social and medical costs of unnecessary admissions and interventions and perhaps a reappraisal of the criteria by which benefit is assessed.

PREFACE

The antenatal wards are an important part of any maternity hospital and the cost of maintaining women as inpatients in these wards comprises a significant proportion of the resources allocated to maternity care. Since there is no consensus of opinion as to which conditions would benefit from hospital admission, there are no clear guidelines on how such beds should be used and, indeed, there are no readily available data describing the use of these facilities. Given the economic stringencies currently affecting all areas of health care, it is essential to ensure that resources are allocated so as to provide maximum benefit and antenatal inpatient care is an area which merits scrutiny; before attempting any rationalisation of services, however, it is necessary to consider current practices.

Antenatal care is a relatively recent addition to obstetric practice. Historically, many factors have contributed to the evolution of care for childbearing women in its present form and the development of the respective roles of the personnel involved. Thus any study of current obstetric practice should be considered in a historical context; in particular, current use of antenatal inpatient care can best be appreciated with an understanding of the origins and initial objectives of this form of management.

This study, therefore, begins by examining the history and development, first of obstetric care then of antenatal inpatient care with particular reference to Glasgow Royal Maternity Hospital on whose population of women this study is based. Current use of antenatal inpatient facilities are then examined in a group of

women comprising a random one-third of all women delivered in the hospital in 1983.

The majority of antenatal admissions proved to be due to a relatively small number of conditions or groups of conditions. These conditions each encompassed a wide spectrum of severity and consequently fetal or maternal risk. It is apparent from this study that not only is the accurate identification of these conditions difficult but there are no measurable parameters sufficiently precise to allow identification of those pregnancies at significant risk. The efficacy of hospitalisation as a form of therapy for any given condition can only be assessed by properly conducted scientific trials; nevertheless, in the majority of conditions or groups of conditions encountered in this study, management by antenatal admission to hospital conferred no discernible benefit to mother or baby. While such absence of proven benefit means women should not be pressurised into accepting hospital admission, the converse, that admission is never justified for these conditions, is not necessarily true. Current use of antenatal admission is inconsistent without any apparent logical basis and a reappraisal of this whole area of obstetric care is required. It may be, however, that in some cases there are benefits from antenatal admission but of a less medically obvious nature and that the criteria by which we assess benefit should also be reappraised.

CHAPTER I - DEVELOPMENT OF OBSTETRIC PRACTICE AND ORIGINS OF ANTENATAL CARE

That women were operating as midwives as early as biblical times is demonstrated by the reference to such a woman in Genesis XXXV, 17. Usually these women had themselves borne children and, indeed, this qualification was a legal requirement for midwives in Ancient Athens (Radcliffe, 1967a). Traditionally, women were involved in treating the sick and in Ancient Greece and Rome the practice of medicine appears to have been open to both sexes equally. Not only were women's medical credentials recognised but in obstetrics and gynaecology they appear to have operated something of a monopoly although the Roman writer Hyginus, Superintendent of the Palatine Library under Augustus, claimed the Ancient Athenians forbade the practice of midwifery and medicine by women and slaves (Rowland, 1981a). Hippocrates, dominant in the Greek school of medicine in the 5th century BC, influenced medical thinking for centuries; while the outstanding feature of most medical writings attributed to him is a more scientific approach with a departure from traditional superstition, this is not apparent in the works on midwifery he is believed to have written suggesting his practical involvement in this area was minimal. Although it would appear from the writings of Soranus of Ephesus in the 2nd century AD that male physicians were by then practising some

obstetrics, it is equally clear that the field was still largely dominated by women, both as obstetricians and midwives (Donnison, 1977a).

By mediaeval times the degree to which women were permitted to practice medicine varied from country to country but in Britain until the 13th century both sexes were involved, both trained and untrained. The only difference arose from the fact that the women were barred from the universities and were therefore unable to obtain the official qualifications and consequent professional recognition. In the 13th century the barber-surgeon guilds were introduced, limiting the practice of medicine (in those areas where the system operated) to holders of the guilds' licence who were entitled to prosecute non-licensed practitioners (Donnison, 1977b). Few women were admitted to such guilds. In 1423, following a petition by physicians, Parliament agreed to limit the practice of "fysyk" to university trained practitioners and to bar women from its practice altogether (Rowland, 1981b). Nevertheless, some women apparently continued to practice obstetrics and care of women in child-birth remained in the hands of the midwives. The scope of the midwives' role was however affected by the development of the barber-surgeon guilds; since these limited the use of surgical instruments to member surgeons, midwives were consequently obliged to call for their assistance in difficult or abnormal cases. At that time, however, such assistance was

limited to destructive delivery of the fetus or post mortem caesarean section. This latter procedure could, if necessary, be carried out by the midwife who in fact had a duty to the Church to perform such an operation to allow the child to be christened, thus saving its soul (Donnison, 1977c).

Nevertheless, although early practical obstetrics lay in the hands of women, most theoretical writings on the subject came from male physicians whose works continued to influence obstetric teaching for centuries. One exception was a treatise on woman and child care which emanated from the Medical School of Salerno in Italy in the 11th century and was attributed to one Trotula, allegedly a woman. The preface of the version printed in Strasbourg in 1544 explains the book was written because of the increased incidence of illness in women as the weaker sex; the treatment of such ailments by male doctors being inappropriate there was a consequent need for a study of women's illnesses by a woman (Rowland, 1981c). Both the identity and sex of Trotula have, however, been disputed throughout the ensuing centuries and the question has never been satisfactorily resolved.

Of the male writers, Galen, whose anatomical beliefs were based largely on animal anatomy, influenced the field until mediaeval times. Soranus of Ephesus, whose work predated that of Galen (he died when Galen was eight), was the first to specialise in obstetrics and gynaecology. Although from his writings he would appear to have

been more concerned with gynaecology, his knowledge of female anatomy was excellent for his time and his remarks on practical aspects of obstetrics show at least a degree of first-hand experience. His "manuscripts" were translated into Latin by Moschion, probably an African trained at Alexandria; although his original manuscript was lost, his works persisted although errors crept in with time and later additions appeared, such as the series of drawings of the fetus in utero seen in many subsequent copies and translations of his work.

The development and spread of obstetric knowledge also influenced the personnel involved in provision of obstetric services and the development of their particular roles.

The introduction of printing in the mid 15th century led to the wider dissemination of knowledge although the knowledge itself progressed very little. Thus an English translation based on the Moschion manuscript published in 1540 as the "Byrth of Mankynde" by Thomas Raynald became the first widely available English book on obstetrics and influenced most subsequent publications on the subject until the end of the 17th century. By now, the woman's role was largely confined to midwifery with medical practice almost exclusively male; moreover, as has been discussed, men were also moving into the realms of midwifery, such a trend being particularly marked in France where the example of royalty later lent weight to this fashion. Since most women were illiterate, their access to formal learning was also limited; although an act of 1512 introduced formal licensing for many categories of employment including midwifery, this licensing was under the control of the Church and was concerned

with social, religious and moral aspects of the midwife's role without regard for her level of knowledge or professional competence.

Real progress in obstetrical knowledge was made by men and began with the critical study of the relevant anatomy in Italian centres, the most prominent being Padua. The lead in this field was taken not by medical men but by Renaissance Artists. The most significant early work was done by Leonardo da Vinci whose anatomical drawings, along with those of the later Vesalius, are still widely known. Significant contributions also came from Fallopio (who, like Vesalius, was a holder of the Chair of Anatomy at Padua), Eustachius, Avanzi Mercurio and Fabricius. The Englishman, Caius, studied in Padua under Vesalius and was responsible for introducing his teachings to Britain. His work was continued by his successor Harvey, who similarly studied at Padua under Fabricius (Radcliffe, 1967b).

Following the advances in anatomical knowledge came the scientific study of practical obstetrics. This largely originated in France, the first important centre for teaching of midwifery being the Hotel Dieu in Paris where Ambrose Paré gained his experience in the 16th century. He was followed at the Hotel Dieu by a succession of ultimately famous obstetricians but also by Louyse Bourgeois, later royal midwife and author of the first textbook for midwives. In addition to affording a wealth of experience leading to advances in obstetric knowledge, the Hotel Dieu as a charity turned no-one away and delivered almost fifteen hundred women a year.

There is evidence of earlier, very limited, lying-in facilities for women in England. In mediaeval times, monks and nuns acted as medical advisers and secular lying-in hospitals did exist. Among others, St. Thomas at Canterbury, in addition to providing assistance to pilgrims, looked after women in childbirth. Richard Whittingham, a London mercer, established a lying-in hospital run by women for women having illegitimate children at St. Thomas, Southwark, in the early 15th century. Nevertheless, in the 17th century when the fame of the Hotel Dieu in Paris was at its height, similar lying-in facilities for women in Britain did not exist. John Douglas, a London surgeon who advocated better training of midwives, wished to see lying-in hospitals established in all principal cities of England (Donnison, 1977d); his objective, however, was to promote teaching of midwifery rather than to provide facilities for pregnant women. In 1739, three years after Douglas's plea was made, Sir Richard Manningham, a male midwife, established a "charitable infirmary" in St. James' Infirmary, Westminster, for use by poor, married women. He called on Parliament to recognise its duty to establish national lying-in hospitals to serve the needs of all pregnant women.

The setting up of permanent lying-in hospitals began with the Rotunda in Dublin in 1745 followed by a number of London institutions during the following 20 years and in 1756 the opening of the first Scottish lying-in wards in the Royal Infirmary in Edinburgh. Such institutions, however, were not the result of Government action but were charitable organisations and such voluntary hospitals were dependent on public subscription and the philanthropy of the wealthy

middle classes (Donnison, 1977e). An additional source of income came from the fees of midwives trained in these hospitals. Such hospitals were, however, small and thus the numbers of women who could be delivered in them were small. While these were mainly poor married women, those whose need was greatest were often unable to gain admission and had to be confined in their own homes or in the poor house. The development of outdoor departments in many of these hospitals with provision of midwives to conduct deliveries in the home eventually made skilled help in childbirth available to large numbers of women.

Nevertheless, at this stage, services to childbearing women were to all intents and purposes confined to the actual time of delivery. Little had been written about antenatal problems and their management; with the exception of a few women with life threatening conditions, most women were not admitted to hospital or cared for at home by trained personnel until they were actually in labour. It was not until the present century that the concept of antenatal care was given serious consideration and the value of medical care of the pregnant woman recognised, initially because of the effect it might have in improving infant mortality rates and eventually as a means of safeguarding the health of the mother herself.

CHAPTER II - ANTENATAL CARE IN GLASGOW - THE HISTORY OF GLASGOW ROYAL MATERNITY HOSPITAL

While in England the opening of the British Lying-in Hospital marked the introduction of hospitals caring specifically for women in childbirth, similar services reached Scotland only a considerable time later. As has been noted, the first lying-in beds in Scotland were established in 1756 when Thomas Young, on his election to the chair of midwifery in Edinburgh, persuaded the managers of the Royal Infirmary to allow him to use the attic of the Infirmary for this purpose.

In Glasgow, at that time, no hospital facilities existed; the Glasgow Royal Infirmary did not open until 1794 by which time a small lying-in hospital had already been opened by James Towers who was thus able to add practical clinical tuition to the theoretical instruction he was already providing with his course of midwifery lectures. This institution, for use by poor married women was maintained by Towers; the running costs were to some extent offset by the fees of students attending for instruction and later he was given further financial assistance in the form of annual sums paid first by the University and later by the Town Council (Dow, 1984a). The ultimate fate of James Towers' hospital and the provision of lying-in facilities in Glasgow between 1796 and the establishment of the Glasgow Lying-in Hospital in 1834 is not entirely clear. One theory suggests Towers' institution, the Glasgow University Lying-in Hospital, was interdicted in 1796 and ceased to function (Christie, 1888a). This erroneous claim was made by Dr. James Wilson in an address to students attending the Glasgow Lying-in Hospital which appeared in

that hospital's report for 1851-2 and was published in the Glasgow Medical Journal in 1853 (Dow, 1984b). Whatever the details, it is apparent that the hospital continued to be run by the Towers family, first James then his son John, until the death of the latter in 1833.

On 18th September 1834 a meeting was held to discuss the future of the Lying-in Hospital connected with the University. Whether the hospital briefly ceased to function on Towers' death is not clear but in any case the new venture was ready to start functioning in October 1834. On 19th September 1834, the day after the meeting concerning the University Lying-In Hospital, another meeting was held to discuss the setting up of a public lying-in hospital. This was to be known as the Glasgow Lying-in Hospital; later to become the Glasgow Maternity Hospital, the institution opened on 10th December 1834 in the premises of the old Grammar School in Grammar School Wynd. The intention was to provide for destitute married women. Unmarried women were officially only to be admitted in dire emergencies; by the time the 25th annual report was published, however, the hospital was described as being for "poor and homeless lying-in women" (Christie, 1888b).

The early years of the hospital were fraught with problems. Recurrent outbreaks of infection led to the hospital being repeatedly closed and financial problems eventually led in 1841 to a move to smaller premises in St. Andrew's Square. The problems were compounded by the publishing in 1843 of plans to open another rival institution, the Glasgow General Lying-in Hospital. The Glasgow Lying-in Hospital

survived this new threat and eventually its fortunes improved sufficiently to allow an expansion of its premises into an adjacent building in St. Andrew's Square in 1846. This was, however, regarded as a temporary measure and the ultimate aim was to purchase a permanent home for the hospital.

Thus three lying-in hospitals operated in Glasgow from 1845 to the mid-1850's. Similarities in nomenclature between the Glasgow Lying-in Hospital and the Glasgow General Lying-in Hospital led to some confusion at the time; the confusion extended to subscribers to the hospitals who in some cases mistakenly made contributions to the wrong hospital. For those viewing the situation in retrospect, the confusion is compounded by the adoption by the General Lying-in Hospital of the new title of Glasgow Maternity Hospital; however, by the time the Glasgow Lying-in Hospital adopted the title of Glasgow Maternity or Lying-in Hospital and Dispensary in 1865, the former hospital had ceased to function.

The Glasgow Lying-in Hospital was apparently alone in planning to provide training for midwives as well as medical students (Checkland, 1980) but, like the other hospitals, in addition to delivering increasing numbers of women in it premises, also dealt with an even more rapidly increasing number of "outdoor" confinements. At that time, partly because of the problems of infection in hospitals and partly because it was the more serious cases who were admitted for "indoor" delivery, mortality rates were considerably lower among women confined in their own homes. The question of whether lying-in hospitals were in fact desirable was

the subject of some debate with Pagan, Professor of Midwifery at Glasgow University, a vocal opponent of such hospitals (Dow, 1984c). This opposition may have contributed to the demise of two of the three Glasgow hospitals. The General Lying-in Hospital was apparently still in existence in 1855 but there is no subsequent reference to it. The University Lying-in Hospital became homeless in 1852, and hopes that this might lead to a better and more permanent location for the hospital proved unfounded. It continued, however, to deliver outdoor patients; in 1872 a proposal to amalgamate it with the Glasgow Lying-in Hospital (now the Glasgow Maternity Hospital) was finally defeated. Although the intention was that the University Hospital should therefore find other premises for indoor deliveries, this was also unsuccessful; the hospital ceased functioning altogether and the remaining funds were handed over to the Western Infirmary which then set up its own outdoor maternity unit (Dow, 1984d).

By this time, the Glasgow Maternity Hospital was housed in its new premises in Rottenrow which opened, after considerable alterations and improvements, in 1860. Although considerably better than previous premises, the shortcomings of this new hospital soon became apparent. Closure of the hospital on several occasions due to outbreaks of puerperal fever and on one occasion to leaking sewage pipes seemed only to highlight the already urgently discussed need for the rebuilding of the hospital. This was eventually achieved and the new hospital opened in January 1881 (Christie, 1888c).

The rapid population growth at the time contributed to an increasing work-load for the outdoor department of the hospital which led to the opening in 1888 of the West End Branch in St. Vincent Street; within a few years this Branch had expanded to the point where it dealt with almost a quarter of all the hospital's outdoor cases (Dow, 1984e). Glasgow's population, which exceeded half a million in 1881, continued to rise steeply passing the three-quarters of a million mark by the turn of the century. This population explosion, together with the increasing number of cases deriving from the newly established West End Branch, stretched the hospital to its limits. Following its opening in 1881, the new hospital and its amenities were described in glowing terms (Christie, 1888d) but unfortunately this enthusiasm was short lived; thus the hospital had been open barely 10 years when the question of an extension was raised in the Director's Annual Report. While the rising delivery rate was the main problem a further concern arose from the hospital's role in obstetrical teaching. It was proudly claimed that the Glasgow Lying-in Hospital provided the only school of practical obstetrics in the West of Scotland (Christie, 1888e); in 1896 the Senate reported to the University Court on the need for increased facilities for teaching medical students in obstetrics and gynaecology (Dow, 1984f). The demands of both spheres of activity thus made extension desirable; despite this obvious need to extend the existing hospital, the refurbishment of the Royal Infirmary in honour of Queen Victoria's Diamond Jubilee overshadowed the problems of the Maternity Hospital until the question was once more raised in 1899 by the Glasgow Obstetrical and Gynaecological Society. Various obstacles were

encountered in acquiring suitable property, in construction of the hospital and, not least, in raising the considerable sum of money needed to pay for the project. These financial problems were in no way solved when the new hospital was formally opened in April 1908 but were subsequently alleviated sufficiently for approval to be given in 1914 for the addition of the title "Royal" to the Hospital's name.

It was in the aftermath of the new hospital's opening that the provision of antenatal services was formalised although its origins were much earlier, dating back to the original establishment of the hospital. In 1834, the original constitution for the Glasgow Lying-in Hospital referred to the establishment of a dispensary giving advice on female complaints and children's diseases. Subsequently, this dispensary had a rather intermittent existence as financial fortunes dictated; by the time the hospital made its first move to St. Andrew's Square, the outdoor dispensary had already closed. It reappeared in 1866 as evidenced by the hospital's new name of Glasgow Maternity Hospital and Dispensary and by references to its work in the Hospital's Annual Report of that year (page 7). Presumably it had a further subsequent period in abeyance since, in the early 1880's, the hospital's increasing workload prompted the proposal from Dr. Hugh Miller, Consulting Physician to the Hospital, to resurrect the Dispensary and establish a ward for women's diseases outwith the hospital (Dow, 1984g). Although such inpatient facilities did not materialise for some considerable time, references to the Dispensary's outpatient role appear in a number of subsequent Hospital Reports. Thus, regardless of the precise details of its existence, the Dispensary, by giving

consultations and advice to women with pregnancy problems, provided outpatient antenatal care for many years before this concept was officially recognised.

Such official recognition finally came in 1915; at a meeting of the Glasgow Royal Maternity Hospital Medical Committee in June 1914 Munro Kerr proposed a scheme for a "Dispensary for Pregnant Women" and the concept of antenatal care achieved formal recognition with the opening of the Glasgow Royal Maternity Hospital Antenatal Dispensary in September 1915. At the same time, six beds were set aside for admission of antenatal patients for observation, thus establishing antenatal inpatient care in the hospital.

CHAPTER III - HOSPITALISATION AS A THERAPEUTIC MEASURE - OBJECTIVES OF STUDY

While the opening of the Obstetric Dispensary for Antenatal Care in Rottenrow marked the formal recognition of antenatal care in Glasgow, it was by no means the earliest appearance of this concept. In France, attention had been directed towards this area for some considerable time, and in Britain 14 years had elapsed since Ballantyne published his "Plea for a Pro-Maternity Hospital" in the British Medical Journal (Ballantyne, 1901). It was, in fact, in that same year, 1901, that the first antenatal bed in the United Kingdom was endowed in the Simpson Memorial Pavilion in Edinburgh by Freeland Barbour at Ballantyne's suggestion (Radcliffe, 1967c); however, Haig Ferguson, obstetrician in charge of the Lauriston Pre-Maternity Home for unmarried pregnant women in Edinburgh, had been providing routine antenatal supervision to the home's inmates since 1899. His results made him anxious to extend this service to all pregnant women thus leading to the opening of Britain's first antenatal clinic in 1915, the same year the Antenatal Dispensary opened in Glasgow (Browne, 1935).

Such similarity in timing was not entirely coincidental, merely reflcting an interest in this field which was occurring internationally. Thus it was that during World War I attention was focused throughout Britain on the health of pregnant women. Several factors contributed to this; the poor physical quality of recruits during the Boer War coupled with the declining birth rate led to fears concerning both the quality and quantity of the population since diminution of either was viewed as potentially harmful to the strength of the nation.

Attention was therefore directed towards infant welfare work in an attempt to reduce infant mortality rates. Such objectives did not receive universal approval; the eugenists argued it was undesirable to save such weak and unfit children since such an attempt to interfere with natural selection would lead to a decline in the quality and efficiency of the race. Such doubts were, however, overshadowed when the advent of World War I made the problem of quantity more acute. Greater attention to the problem of infant mortality in view of the double threat to population was urged in the British Medical Journal (BMJ, 1916).

It was also during World War I that the relationship between maternal health and infant health was appreciated, leading to official efforts being directed also towards the antenatal period. Various voluntary moves were made such as the establishment of antenatal clinics as described, but the Maternity and Child Welfare Act of 1918 officially vested local authorities with the powers to set up a range of services, including antenatal clinics, for pregnant women. Safeguarding the mother's health was, however, merely a means to an end; at that time the welfare of the child remained the primary concern and it was some time before the question of maternal health assumed importance in its own right.

While it was recognised that an important objective of antenatal care was the detection and treatment of disorders of pregnancy, the main impetus of the child welfare movement was directed towards education of the mother. Pearson, Professor of Eugenics at University College, argued that good maternal habits

leading to maternal efficiency was the crucial factor in the problem of infant deaths (Pearson, 1913). The contribution made by social and economic factors was virtually dismissed; while the evidence clearly showed that poverty was accompanied by higher death rates, the association was felt to be indirect and it was argued that the deleterious effects of poverty could most efficiently be combatted by education of the mother. During the first 30 years of this century the infant mortality rate was halved (though to what extent this was due to the infant welfare movement is uncertain); the maternal mortality rate however showed no such decline. Increasing attention was therefore focused on the mother and again the two main areas of attention were medical treatment of pregnancy problems and education of the mother.

Antenatal care was seen as the means by which improved results would be obtained; education of the mother would make her aware of the value of antenatal care which in turn, by allowing treatment of pregnancy problems, would reduce maternal mortality. The Glasgow Royal Maternity Hospital (GRMH) Medical Committee's Report for 1915 contains the remark that

> "if women only knew the benefit of this (antenatal care) they would be most enthusiastic about it".

Munro Kerr pointed out that of 18,828 women atttended by the district service of the GRMH from 1926-30, only 10-15% had attended the antenatal clinic regularly. In this context he quotes the Departmental Committee in the Interim Report as stating that

> "the patient herself is often her own worst enemy, whether from ignorance, apathy, ill health or prejudice"
>
> (Kerr, 1933a)

He was convinced all women could go through pregnancy unscathed

> "if they will only place themselves under supervision from the commencement of pregnancy, if they will follow simple instructions as regards health, and if they will continue to do so throughout pregnancy" (Kerr, 1933b)

Again the problem was viewed in purely medical terms and the effects of social and economic deprivation considered of little importance; McKinlay noted no great association between such deprivation and maternal mortality (McKinlay, 1929). Kerr, however, did concede that poverty and malnutrition could at least have a deleterious effect in individual cases but generally this was considered a minor factor.

Great faith was placed in the powers of antenatal care to prevent or cure most pregnancy complications. Kerr stated that

> "most of the graver disturbances can be prevented by simple means" (Kerr, 1933c);

on the evidence that while some regions had very low death rates from eclampsia, the national rate was high, he commented

> "the only possible explanation of this discrepancy is that antenatal care throughout the country is generally inadequate" (Kerr, 1933d)

for

> "one thing is very certain, that the toxaemias of pregnancy can be prevented by very simple precautionary measures" (Kerr, 1933e).

In a study of 466 deaths out of 19,651 cases treated in GRMH from 1926-30 the primary cause of death in 165 was stated to be inadequate or absent antenatal care (Kerr, 1933f). A comparison was made of the death rates in GRMH during this five year period in unbooked and booked cases; the death rate in the former was three times that in the latter group, thus apparently demonstrating the power of antenatal care (Kerr, 1933g).

It is interesting to note that in more recent times claims regarding the efficacy of antenatal care have been made on the basis of similar questionable correlations between quantity of antenatal care and pregnancy outcome. That the problem of women with intercurrent disease was rather more complicated was, however, appreciated and, in the case of healthy women, Kerr emphasised the importance of close observation for early detection of pregnancy disorders. Thus, on the whole, antenatal care continued to be directed - as it still is - towards secondary prevention with treatment of problems as they arose rather than dealing with the primary causes of problems by any means other than attempts at education of the mothers.

Such was the power attributed to antenatal care, but what precisely was adequate antenatal care? Munro Kerr identified three major components:

(1) early attendance with efficient and constant supervision throughout pregnancy

(2) early detection and treatment of problems

(3) admission to hospital where necessary (Kerr, 1933h).

In his view, antenatal care had two aims:-

(1) to carry the pregnant woman through pregnancy with least degree of disturbance to her general health

(2) to prepare her for labour so that she may pass through it as safely and easily as possible (Kerr, 1933i)

Browne's views embodied sentiments which were similar if rather less generally stated. They were to:-

(1) remove anxiety and dread

(2) remove discomfort

(3) ensure the early treatment of complications

(4) increase the proportion of normal labours

(5) lower the maternal death rate

(6) lower the stillbirth rate

(Browne, 1932)

Having defined adequate antenatal care and identified its objectives as perceived at that time, one must now examine current views on the subject. Antenatal admission to hospital is one method of treatment for antenatal problems; in this context the reasons for and aims of hospital admission can be examined. Any changes in practice over the years can then be considered in the light of changing objectives leading to the evolution of current concepts on the role of antenatal care and use of in-patient facilities.

It is interesting to note that, in contrast to the confidence with which antenatal care was defined in the 1930's, the Social Services Committee (Short Report) in 1980, while accepting its value, expressed uncertainty as to what exactly it was and how it worked. (Social Services Committee, 1980)

There is no doubt that in its evolution antenatal care has undergone many changes and developments and certain trends can be observed. Not only do more pregnant women receive antenatal care

but they receive it earlier in their pregnancies and on a more regular basis. While as part of the general progress in medicine certain diseases of the mother are now amenable to specific treatment (eg diabetes mellitus), technological advances in the sphere of perinatal medicine have led to greatly extended potential in the realms of prenatal diagnosis and treatment and monitoring of the fetus. This has resulted in a shift of concern from the mother to the fetus; as Donald points out,

> "the wheel has turned full circle and Ballantyne's original teratological interest is revived" (Donald, 1974).

With such technology has come the increased centralisation of antenatal care and increased hospitalisation of childbirth.

Nevertheless, despite the Short Report's uncertainty on the precise nature of antenatal care, despite the changing methods and shifting emphasis of this care, its overall aims and basic ideology have apparently remained essentially constant. Thus in 1982 the following were proposed as goals of obstetric care:-

(1) the detection of previously unrecognised maternal disease (e.g. unsuspected heart disease)

(2) the prediction, prevention, early detection and management of complications of pregnancy

(3) the amelioration of the discomforts and minor complaints of pregnancy (e.g. heartburn, constipation, leg cramps)

(4) preparation of the couple for childbearing and childrearing

(5) preventive and promotive health education (e.g. on smoking, diet, exercise, family planning)

(Parboosingh and Kerr, 1982)

What, then, of the use of hospital admission as a method of antenatal treatment? Ballantyne was concerned by the lack of understanding of the physiology and pathology of pregnancy; progress in these areas would, he felt, lead to improvement of antenatal diagnosis and therapeutics and the pro-maternity hospital would afford him the facilities for such observation and investigation. There were basically two categories of women he envisaged would be admitted, namely those with previous pregnancy problems and those who developed complications in their current pregnancies. While these were his main categories, he also felt that, as the service expanded, in-patient management would also be used for those essentially normal women who required rest in late pregnancy (Ballantyne, 1901).

Munro Kerr held similar views on the subject. He felt in-patient care might be necessary for prolonged periods for women with intercurrent disease since such diseases were responsible for 13.2% of fatalities in GRMH from 1926-30 (Kerr, 1933j); expectant mothers with young families would, in his opinion, benefit from hospital admission to avoid excessive fatigue (Kerr, 1933k), and, finally, for those women in whom out-patient supervision failed

to prevent development of complications, admission was essential for satisfactory treatment (Kerr, 19331).

Thus hospital admission was broadly-speaking seen as indicated for two basic groups of women; those with a risk factor identifiable before the pregnancy began, whether in the form of previous pregnancy problems or intercurrent maternal disease, and those for whom the indication arose during pregnancy either as a specific complication or merely the need for rest prior to delivery. These basic premises are so self-evident that their statement seems almost superfluous; nevertheless, they were identified 50 years ago and must still obtain today.

Given the range and complexity of problems which can arise in antenatal care and the paucity of scientific data relating to the use of hospital admission as a therapeutic measure, it is hardly surprising that nowhere, either then or now, have the criteria for hospital admission been stated other than in these general terms. Melville Kerr observes that:

> "in general, obstetric practice rests on two modalities of treatment - hospitalisation for bed rest and observation, and timed delivery" (Kerr, 1980)

In current practice, the reasons for hospital admission must fall into four categories - observation, bed rest, investigation and treatment. Investigation and treatment of complications can usually be carried out on an out-patient basis unless their intensity or nature makes this impractical, in which case admission to hospital is employed. The combination of bed rest

and observation is, however, as Kerr notes, the indication for a large proportion of hospital admissions with investigation and treatment a less common indication; this accords well with what Ballantyne wrote more than 80 years ago. It must be noted, however, that bed rest is viewed as a therapeutic measure in its own right; this is despite the fact that, as Chalmers points out, apart from in the presence of dramatic maternal or fetal pathology, no benefits from hospitalisation for observation and bed rest have so far been established and such management has been the subject of very little scientifically sound research. He also points out the considerable economic costs of such (often prolonged) in-patient care and questions whether such use of resources, in the absence of proven benefit, is justified in the current economic climate (Enkin and Chalmers, 1982).

This study does not aim to provide any answers on the benefits of hospitalisation for individual conditions; like any other therapeutic measure, its effectiveness can only be assessed through well designed prospective randomised controlled trials. Before studying antenatal admission in the context of clinical trials, however, it is desirable to examine actual clinical practice, to establish precisely the way in which in-patient care is currently being employed and to see whether there is any discernible influence on pregnancy outcome of in-patient care as it is currently employed.

This retrospective study is therefore concerned with actual clinical practice, the thesis being that, while there are some

conditions for which the benefits of hospital admission are clearly demonstrable and where this method of treatment is universally employed, such conditions are responsible for a minority of admissions; the majority of admissions responsible for the major proportion of in-patient resources are for conditions which are often ill-defined, where the objectives are ill-defined and for which the benefits of hospitalisation have yet to be established. Furthermore, because of the lack of recognised criteria for admission, practices are not consistent varying between hospitals, between clinicians and even within the sphere of action of individual clinicians; such decisions appear to be influenced either consciously or subconsciously by a variety of factors, often unquantified or unidentified, whose sum total results in a clinical judgement seemingly appropriate to the individual case but often without any sound scientific or logical basis.

If such a situation is confirmed, the next step should be an attempt to clarify these "unquantified and unidentified" factors and to identify, by clinical trials as described, those areas where definite benefits of inpatient care - in whatever terms - can be demonstrated. Only then can current practices be reappraised with the objective of establishing a more rational, scientific and consistent basis for antenatal in-patient care.

CHAPTER IV - METHODS OF STUDY

This study was a retrospective analysis of the case records of a randomly selected one-third of all women who delivered in the Glasgow Royal Maternity Hospital (GRMH) in 1983. The GRMH is a large teaching hospital situated in the East End of Glasgow which forms its catchment area. The Greater Glasgow Health Board serves a population of one million and in 1983 its five maternity hospitals delivered 14,579 women; each provides a service primarily for its own district but cross-boundary flow does exist. The city has a high level of unemployment and areas of marked socio-economic deprivation; such problems are particularly marked in the Eastern district where a much higher proportion of the population are in the lower social classes. The hospital has a consultant staff of eight; antenatal care, which is largely on a shared care basis, is provided at clinics which take place in the hospital with the exception of one community based clinic, operated by hospital staff but situated in a Health Centre, five miles from the hospital. Of the hospital's 150 beds, approximately 70 are designated as antenatal beds although the ward composition of several larger wards and a number of smaller units allows variation in allocation as needs dictate. By 1983, when this study was carried out, a Day Care Service for women with hypertension had been set up and was fully operational; thus such women could be investigated and monitored on an out-patient basis and were only formally admitted to hospital if the blood pressure was still significantly elevated at the end of the observation period.

In 1983, 3,934 women were delivered in the Royal Maternity Hospital at 24 weeks gestation or more. Those women who had an

earlier spontaneous abortion or a therapeutic abortion for fetal abnormality were omitted; although a number of these women may have spent some time in antenatal beds prior to abortion, this group as a whole was not considered relevant to this particular study.

The total population of 3,934 women thus consisted of 3,886 women with single births and 48 women with twin pregnancies. There were a total of 30 perinatal deaths - 18 stillbirths and 12 first week deaths - giving a perinatal mortality rate for the hospital of 7.6/1000 in 1983.

A random one-third of these 3,934 women was selected for study; this was achieved by the allocation of a random series of numbers to the women's names as they appeared in chronological order in the hospital delivery records. A list of 1,311 names was thus generated; 9 case records were not available for study and the remaining 1,302 women formed the basis of this study.

A computer compatible data collection form was designed and subsequently amended slightly following a pilot study of 100 case records; the proforma in its final form is shown in Appendix I. The information on page 1 consists of maternal characteristics, details of the past obstetric history and general information regarding the current pregnancy. Page 2 is concerned with information on delivery and pregnancy outcome, while on page 3 are recorded all the complications of the current pregnancy as well as the relevant information regarding timing, presentation and management of these complications. One page 1, the information concerning maternal

characteristics and past obstetric history was obtained from the Scottish Morbidity Record 2 (SMR2), while the information regarding the current pregnancy was obtained from the case records. Likewise, the information on page 2 was obtained directly from the SMR2 document with the exception of the gestation at delivery, mode of onset of labour/delivery and duration of labour. These data were obtained by inspection of the case records, using all the information thus available to minimise possible error and achieve consistency of clinical interpretation of the facts.

A list of all possible obstetric complications and risk factors was drawn up and given appropriate coding numbers. For each woman in the sample all the information in the case records was then examined including medical outpatient and inpatient notes, nursing notes and results of investigations carried out, and details of all complications or risk factors were recorded on page 3 using the appropriate coding number. The gestation in completed weeks at which the complication occurred and whether or not the woman was admitted to hospital were recorded in the second and third columns. For those complications resulting in admission, the next three columns were also filled in - namely, duration of admission in days, source of admission and condition of the woman on discharge. For all complications, the final double column was filled in; in the first part investigations or monitoring and their results were recorded and in the second part was noted the outcome of the complication. All the relevant coding information for page 3 is included in the appendix; where definitions of conditions are given these are discussed in the appropriate sections.

Some information regarding past obstetric history, already recorded on page 1 was also recorded on page 3 as constituting a complication or risk factor in the current pregnancy. The complications were in all cases coded as the initial diagnosis; where subsequent observation or investigation showed this to be incorrect this was indicated by the coding in the final column and where a different diagnosis was then proposed this was recorded as an additional complication.

Those complications not included in the list given were coded as "other" but the precise diagnosis noted. An additional 115 complications/risk factors were thus noted. Each occurred very infrequently and in total these 115 complications accounted for 9% of all complications recorded and were, therefore, not allocated individual coding numbers.

Although the day care area is staffed by midwives from the hospital wards and thus places a burden on inpatient rather than outpatient facilities, attendance for day care was not recorded as an admission unless the woman was retained in hospital overnight; the complication and its investigation and management on an outpatient basis was, however, recorded. Similarly, admissions purely for induction of labour were not recorded. Hospital policy is for women to be admitted early in the morning of the day when induction is planned. A few women, for their own convenience, were admitted the previous day but earlier admissions were usually because of the presence of some complication. Thus the admission was only recorded if some complication was noted or if induction did not

take place within 24 hours of admission.

All the information thus recorded on the proforma was entered on the University of Glasgow ICL 2988 computer and the data analysed using the Statistical Package for the Social Sciences (SPSS); the basic data so provided was then used to compare the group of women admitted with those not admitted antenatally and to assess the incidence of the complications recorded and identify those most commonly resulting in antenatal admission. Where individual conditions were considered the information was obtained by inspection of the relvant individual data sheets.

CHAPTER V - THE WOMEN STUDIED - PRE-EXISTING RISK FACTORS

Two main groups of women have already been identified for whom antenatal admission to hospital might be indicated; those with a risk factor present at the outset of pregnancy and those who develop complications during pregnancy. The first premise will be examined by comparing the two groups of women within the study population - those not admitted and those admitted antenatally - in terms of demographic data and details of past obstetric histories to see whether any differences can be observed reflecting direct or indirect effects on admission rates. The number of women in the sample with medical problems predating the pregnancy is small; since such problems are also less likely to affect admission rates indirectly, the various conditions are considered individually and admission rates directly attributable to these problems are examined.

A. Characteristics of the 2 groups

Of the 1302 women in the study population, 631 (48.5%) were admitted to hospital antenatally on at least one occasion. In the study group as a whole, 575 (44.2%) were primiparae, 190 (14.6%) were unmarried, 129 (9.9%) were less than 20 years old, 79 (6.1%) were aged 35 years or over and 45 (3.5%) were of short stature (height <150 cms). According to their husbands' occupation, 201 (15.4%) were in social classes 1 and 2, 221 (17.0%) were in social classes 4 and 5, and 231 (17.7%) had husbands who were unemployed, the unemployment rate among husbands being 20.8%. Although not constituting pre-existing risk factors, three other features of the groups discussed here are the gestation at booking, the number of antenatal clinic attendances and the admission rates by consultant.

(i) Age and Parity

The age and parity distributions of the two groups are shown in tables V/I and V/II while in tables V/III and V/IV this information is combined to give the age distribution by parity in the two groups. From tables V/I and V/II it can be seen that while there were rather more primiparae, slightly more younger women and slightly fewer older women in the admitted group, these differences are minimal and not statistically significant. The picture obtained from the combined information in tables V/III and V/IV is similar; the only minor difference is in women aged ⩾35 years, where rather fewer primiparae and rather more parous women were admitted. It is noticeable, however, that not only are the differences shown by these four tables small and not statistically significant, but the striking feature of the data in these tables is the close similarity between the two groups of women.

(ii) Marital Status

Table V/V shows the marital status of the women in the two groups. There were slightly more unmarried women in the admitted group (16.0%) than in the non-admitted group (13.3%) but the difference is not significant and the proportions in the two groups are very similar. In table V/VI the age distribution of the single women in the two groups is shown; in the non-admitted group 41.6% of unmarried women (5.5% of the whole group) were aged <20 years compared to 38.6% of unmarried women (6.2% of the whole group) in the admitted population. It is thus apparent that there was not a preponderance of young, unmarried women in the admitted group.

(iii) Height

Table V/VII shows the height distribution in the two groups and once more they are remarkably similar; slightly more shorter women and slightly fewer taller women were admitted antenatally but these differences are very small and certainly not of statistical significance. It could be argued that short stature might generate more alarm in the case of the primiparous woman; table V/VIII, therefore, shows the height distribution for primiparae in the two groups. The proportion of primiparae who are of short stature (height <150 cms) is almost identical in the two groups (4.1% in the non-admitted and 4.2% in the admitted group). Short stature primiparae comprise a slightly higher proportion of the admitted group (1.6% of the non-admitted and 2.1% of the admitted group) but once again this difference is minimal and not of statistical significance.

(iv) Social Class

The social class distribution of the two groups as judged by the occupation of the husband according to the Registrar General's classification is shown in table V/IX. Those women who appear in the column headed "not applicable" were unmarried. In the admitted group there are slightly fewer women with husbands in social classes 1 and 2 while slightly more are in social class 5. The unemployment rate is also slightly higher among husbands of women who were admitted but again these differences are all minimal. In the non-admitted group 231 (34.5%) women were employed at the time of booking compared to 217 (34.4%) in the admitted group.

(v) Gestation at Booking

Table V/X shows the breakdown of gestation at booking for the two groups. Thus in the non-admitted group 527 (78.5%) booked before 20 weeks gestation compared to 491 (77.9%) of the admitted group. The women in the column headed "not applicable" were either transferred from another hospital for delivery or had had no antenatal care. The 6 such women in the non-admitted group were delivered within 24 hours of admission while the 5 women in the admitted group spent at least 24 hours in hospital prior to delivery. In terms of gestation at booking there is yet again no difference between the two groups.

(vi) Antenatal Clinic Attendances

Table V/XI shows the number of attendances at the antenatal clinic for the two groups. One might expect the attendance rates to be higher in the admitted group reflecting a higher incidence of complications or, conversely, it could be argued that while in hospital as in-patients women would not be attending the clinic, and the number of visits in the admitted group might be further reduced if the complications they experienced were sufficiently severe to warrant early delivery. In fact, no such differences are apparent and once again the figures for the two groups are very similar. Six women (0.9%) in the non-admitted group and 5 (0.8%) in the admitted group never attended the antenatal clinic while 22 women (3.1%) in the non-admitted group and 31 (5.0%) in the admitted group attended on 10 or more occasions. Most women, however, had between 4 and 7 attendances; 475 (70.7%) in the non-admitted group and 415 (65.7%) in the admitted group fell into this category. Rather than reflecting

the presence or absence of complications, the number of clinic attendances appears to be determined more by the gestation at booking as is shown in tables V/XII and V/XIII.

(vii) Admission Rates by Consultant

Table V/XIV shows the proportions of women in the two groups under the care of each of the 8 consultants and allows comparison of the admission rates for individual consultants. Variations in the latter might be expected, for example, as a result of referral of specific problems to different consultants according to their individual interests or because of social class differences among women attending different consultants. Thus, rather more than half the women attending consultants 2, 4, 7 and 8 were admitted while rather less than half the women attending consultants 1, 3 and 5 were admitted and exactly half the women attending consultant 6 were admitted. While these differences in admission rates are statistically significant, however, there do not appear to be marked differences in practice between different consultants.

It is thus apparent that, in terms of the characteristics discussed, the two populations of women (those not admitted and those admitted antenatally) are very similar indeed. While it was not stated that for those women who were admitted this action was taken because of demographic features which might be construed as unfavourable, one could imagine that the presence of such features might influence decision making on management of other clinical situations; thus such risk factors, by lowering the threshold for action or intervention

might indirectly lead to an increase in antenatal admission rates. Obviously, however, sufficient alarm was not generated to make such women more likely to be admitted to hospital antenatally either by direct or indirect influence.

B. Past Obstetric History

(i) Previous Perinatal Death

In the total study group of 1302 women, 33 (2.5%) had a history of one or more perinatal deaths. From table V/XV it can be seen that 21 (63.6%) of these women were admitted antenatally on at least one occasion (3.4% of the admitted group) compared to 12 (36.4%) who were never admitted antenatally (1.7% of the non-admitted group). Although the numbers are small, this difference is statistically significant ($p<0.001$) showing that in this study group women with a history of a perinatal death were in general more likely to be admitted to hospital antenatally. While the numbers are even smaller, it is interesting to look at the problem in terms of numbers of perinatal deaths per woman. Of the 33 women, 29 had had one previous perinatal death while four had had two or more perinatal deaths (one woman had had two and three women had had three). Of the former, 20 (69.0%) were admitted whereas of the latter, arguably the higher risk category, only one was admitted antenatally. A further point of interest is that of the 21 women with a previous perinatal death who were admitted antenatally, only two women, each with a history of a previous stillbirth, were admitted specifically because of that problem. Thus, while a history of a previous perinatal death led to a statistically increased chance of antenatal admission, this effect was an indirect one.

(ii) Previous Spontaneous Abortion

Table V/XVI shows the numbers of women in both groups who had had a previous spontaneous abortion; although slightly more of the women in the admitted group had had a previous spontaneous abortion, in this case the difference is minimal and not significant. Moreover, of the 108 such women who were admitted, in only six cases was this given as the specific indication for admission.

(iii) Previous Preterm Labour

In the group of 1302 women there were 50 (3.8%) with a history of preterm labour resulting in delivery at less than 37 completed weeks gestation. Of these, 20 (40%) were not admitted (3.0% of the non-admitted group) compared to 30 (60%) who were admitted antenatally on at least one occasion (4.8% of the admitted group). Only three of the 30 women, however, were admitted specifically because of this past history. This difference in admission rate is not statistically significant.

(iv) Previous Infertility

There were in the total group, 30 (2.3%) women with a past history of infertility. Of these, 18 (60%) were not admitted (2.7% of the non-admitted group) while 12 (40%) were admitted antenatally (1.9% of the admitted group). Again this difference is not statistically significant and moreover none of these women were admitted specifically because of a history of infertility.

(v) Previous Small-for-dates Baby

There were in the group of 1302 women 103 women (7.9% of the total group, 14.2% of parous women) with a past history of having been delivered of a baby weighing less than the 10th centile of weight for gestational age. Forty-five (43.7%) of these women were not admitted (6.7% of the non-admitted group) compared to 58 (56.3%) who were admitted antenatally (9.2% of the admitted group). Once again this difference is not significant and no woman was admitted specifically because of this past histry.

Thus it is apparent that of the various obstetric problems discussed only a history of a previous perinatal death statistically increased the chances of antenatal admission to hospital and that only by an indirect influence. The other factors considered were rarely if ever cited as the specific indication for admission and, further, did not appear to have even an indirect effect on admission rates since women with a history of such problems were not statistically more likely to be admitted to hospital antenatally.

C. Pre-Existing Medical Conditions

When antenatal care was introduced, severe or life-threatening maternal disease was relatively common; in current obstetric practice in this country serious intercurrent medical disorders are rare. Since the numbers are consequently small and any influence on admissions is likely to be direct, the various conditions encountered are considered individually and only in terms of admissions directly attributed to these conditions.

Seventy-one women (5.5%) in the total population of 1302 women either suffered from a medical disorder whose onset predated the pregnancy or had a history of past medical problems which might be relevant to the management of the pregnancy.

(i) Respiratory Disorders

Fourteen women suffered from respiratory disease; nine were asthmatics, four suffered from chronic bronchitis and one woman had a history of tuberculosis. None of these women were admitted antenatally because of these conditions.

(ii) Endocrine Disorders

Ten women had endocrine disorders; six women were insulin dependent diabetics, two were hypothyroid and on treatment, one was on treatment for hyperthyroidism and one woman had had previous surgery for a pituitary prolactinoma. All six women with diabetes were admitted antenatally on at least one occasion for stabilisation or treatment of complications of their diabetes. All six women were also admitted for varying periods of time at the end of their pregnancies to await delivery. None of the other four women were admitted antenatally because of their medical problems.

(iii) Neurological Disorders

Ten women had neurological disorders; five were epileptics on anticonvulsant therapy, four had a history of epilepsy but were not on therapy when they became pregnant and one woman had multiple sclerosis. There were no antenatal admissions in this group of women attributed to these disorders.

(iv) Psychiatric Disorders

Nine women in the group had psychiatric problems; five women suffered from psychiatric disorders with anxiety or depression as the main feature and four were drug addicts. Of the former, one woman was admitted antenatally because of depression and, of the latter, two women were admitted antenatally for treatment of their drug addiction.

(v) Haematological Disorders

Eight women had haematological disorders; three had a history of previous deep venous thrombosis and/or pulmonary embolus, one woman had a thrombocytosis of uncertain aetiology, one suffered from thalassaemia minor, one from Von Willebrands disease and two had been suspected in the past as having some unspecified form of bleeding tendency. None of these women were admitted antenatally because of these problems.

(vi) Cardiovascular Disorders

Seven women in the group were known to have cardiac disease but none were admitted antenatally because of this. Thirty-four women had hypertension which predated the pregnancy of whom 15 (44.1%, 2.4% of the admitted group) were admitted specifically because of this compared to 19 (55.9%, 2.8% of the non-admitted group) who were not.

(vii) Renal Disorders

Six women had renal disorders; two women had renal calculi, one was known to have one non-functioning kidney, two had chronic

pyelonephritis with impairment of renal function and one had a longstanding history of recurrent pyelonephritis but with no evidence of impaired renal function. There were no antenatal admissions in this group attributable to these complications.

(viii) Gastrointestinal Disorders

There were six women in the group who had gastrointestinal disorders; two were known to have hiatus hernia, one woman had Crohns disease, one had diverticular disease, one had ulcerative colitis and one woman had been diagnosed as suffering from an unspecified form of colitis. Once again there were no antenatal admissions among these women attributed to these problems.

(ix) Autoimmune Disorders

One woman in the group suffered from rheumatoid arthritis but did not require antenatal admission because of this.

It is therefore apparent that not only are medical disorders uncommon in current obstetric practice but, with a few exceptions, they rarely prompt antenatal admission to hospital. The exceptions were diabetes mellitus which invariably led to at least one admission and chronic hypertension for which almost half the women were admitted. Drug addiction, while resulting in admission of half of the women concerned, was an uncommon problem in this study group. The question of chronic hypertension will be considered in greater detail in that section dealing with hypertension in pregnancy as a whole.

Pre-existing risk factors, either in terms of demographic features, past obstetric history or intercurrent medical disease would therefore appear in this study group to have contributed minimally, if at all, to antenatal admission rates. The exceptions were a history of a previous perinatal death which statistically increased the chances of antenatal admission by an indirect influence, and diabetes mellitus where management invariably included at least two antenatal admissions for that specific indication. One can therefore conclude that the vast majority of antenatal admissions in this study population were occasioned by complications which arose during the course of the current pregnancy.

	Parity					
	0	1	2	3	⩾4	Total
Not admitted	266	244	110	30	21	671
	39.6%	*36.4%*	*16.4%*	*4.5%*	*3.1%*	*100%*
Admitted	309	181	92	30	19	631
	49.0%	*28.7%*	*14.6%*	*4.8%*	*3.0%*	*100%*

TABLE V/I : PARITY DISTRIBUTION IN THE NON-ADMITTED AND ADMITTED GROUPS

	Age					
	<20	20-24	25-29	30-34	⩾35	Total
Not admitted	59	196	243	126	47	671
	8.8%	*29.2%*	*36.2%*	*18.8%*	*7.0%*	*100%*
Admitted	70	210	228	91	32	631
	11.1%	*33.3%*	*36.1%*	*14.4%*	*5.1%*	*100%*

TABLE V/II : AGE DISTRIBUTION IN THE NON-ADMITTED AND ADMITTED GROUPS

Age	Parity 0	1	2	3	>4	Total
<20	50	7	2	0	0	59 *8.8%*
20-24	119	58	18	1	0	196 *29.2%*
25-29	63	108	52	13	7	243 *36.2%*
30-34	26	58	25	10	7	126 *18.8%*
⩾35	8	13	13	6	7	47 *7.0%*
Total	266 *39.6%*	244 *36.4%*	110 *16.4%*	30 *4.5%*	21 *3.1%*	671 *100%*

TABLE V/III : AGE BY PARITY DISTRIBUTION IN THE NON-ADMITTED GROUP

Age	Parity 0	1	2	3	>4	Total
<20	61	9	0	0	0	70 *11.1%*
20-24	121	66	17	6	0	210 *33.3%*
25-29	99	74	41	9	5	228 *36.1%*
30-34	26	27	23	8	7	91 *14.4%*
⩾35	2	5	11	7	7	32 *5.1%*
Total	309 *49.0%*	181 *28.7%*	92 *14.6%*	30 *4.8%*	19 *3.0%*	631 *100%*

TABLE V/IV : AGE BY PARITY DISTRIBUTION IN THE ADMITTED GROUP

	Single	Married	Widowed	Sep/Div	Other	Total
Not admitted	89	556	1	1	24	671
	13.3	*82.9*				*100*
Admitted	101	501	2	1	26	631
	16.0	*79.4*				*100*

TABLE V/V : MARITAL STATUS IN THE NON-ADMITTED AND ADMITTED GROUPS

	<20	20-24	25-29	30-34	>35	Total
Not admitted	37	38	9	4	1	89
	41.6	*42.7*	*10.1*			*100*
	(5.5)	*(5.7)*	*(1.3)*			*(13.3)*
Admitted	39	47	13	2	0	101
	38.6	*46.5*	*12.9*			*100*
	(6.2)	*(7.4)*	*(2.1)*			*(16.0)*

TABLE V/VI : AGE DISTRIBUTION OF SINGLE WOMEN IN THE NON-ADMITTED AND ADMITTED GROUPS

(percentages in brackets = percentage of whole non-admitted or admitted group)

	<150	150-154	155-159	160-164	165-169	>170	N/K	Total
Not admitted	22	94	178	207	99	50	21	671
	3.3	*14.0*	*26.5*	*30.8*	*14.8*	*7.5*	*3.1*	*100*
Admitted	23	102	200	166	81	36	23	631
	3.6	*16.2*	*31.7*	*26.3*	*12.8*	*5.7*	*3.6*	*100*

TABLE V/VII : HEIGHT DISTRIBUTION IN THE NON-ADMITTED AND ADMITTED GROUPS

	<150	150-154	155-159	160-164	165-169	>170	N/K	Total
Not admitted	11	29	72	74	41	28	11	266
	4.1	*10.9*	*27.1*	*27.8*	*15.4*	*10.5*	*4.1*	*100*
	(1.6)	*(4.3)*	*(10.7)*	*(11.0)*	*(6.1)*	*(4.2)*	*(1.6)*	*(39.6)*
Admitted	13	49	95	73	46	18	15	309
	4.2	*15.9*	*30.7*	*23.6*	*14.9*	*5.8*	*4.9*	*100*
	(2.1)	*(7.8)*	*(15.1)*	*(11.6)*	*(7.3)*	*(2.9)*	*(2.4)*	*(49.0)*

TABLE V/VIII : HEIGHT DISTRIBUTION FOR PRIMIGRAVIDAE IN THE NON-ADMITTED AND ADMITTED GROUPS

(percentages in brackets = percentage of total non-admitted or admitted group)

	1	2	3M	3N	4	5	U/E	N/A	N/K	Total
Not admitted	29	82	177	64	74	40	108	89	8	671
	4.3	*12.2*	*26.4*	*9.5*	*11.0*	*5.9*	*16.1*	*13.3*	*1.2*	*100*
Admitted	18	72	136	61	57	50	123	101	13	631
	2.9	*11.4*	*21.6*	*9.7*	*9.0*	*7.9*	*19.5*	*16.0*	*2.1*	*100*

TABLE V/IX : SOCIAL CLASS DISTRIBUTION IN THE NON-ADMITTED AND ADMITTED GROUPS (according to occupation of husband by Registrar General's classification)

	<12	12-15	16-19	>20	N/A	Total
Not admitted	58 *8.6*	197 *44.3*	172 *25.6*	138 *20.6*	6	671 *100*
Admitted	68 *10.8*	263 *41.7*	160 *25.4*	135 *21.4*	5	631 *100*

TABLE V/X : GESTATION AT BOOKING IN THE NON-ADMITTED AND ADMITTED GROUPS

	0	1-3	4-6	7-9	10-12	13-15	16-18	Total
Not admitted	6	87 *13.0*	385 *57.4*	171 *25.5*	20 *3.0*	1	1	671 *100*
Admitted	5	99 *15.7*	323 *51.2*	173 *27.4*	27 *4.3*	4	0	631 *100*

TABLE V/XI : NUMBER OF ANTENATAL CLINIC ATTENDANCES IN THE NON-ADMITTED AND ADMITTED GROUPS

	0	1-3	4-6	7-9	10-12	13-15	16-18	Total
<12	0	4	22	26	6	0	0	58 *8.6%*
12-15	0	18	178	90	9	1	1	297 *44.3%*
16-19	0	22	111	36	3	0	0	172 *25.6%*
⩾20	0	43	74	19	2	0	0	138 *20.6%*
N/A	6	0	0	0	0	0	0	6
Total	6	87 *13.0%*	385 *57.4%*	171 *25.5%*	20 *3.0%*	1	1	671 *100%*

TABLE V/XII : NUMBER OF CLINIC ATTENDANCES BY GESTATION AT BOOKING IN THE NON-ADMITTED GROUP

	0	1-3	4-6	7-9	10-12	13-15	Total
<12	0	3	32	24	5	4	68 *10.8%*
12-15	0	23	136	87	17	0	263 *41.7%*
16-19	0	22	93	41	4	0	160 *25.4%*
>20	0	51	62	21	1	0	135 *21.4%*
N/A	5	0	0	0	0		5
Total	5	99 *15.7%*	323 *51.2%*	173 *27.4%*	27 *4.3%*	4	631 *100%*

TABLE V/XIII : NUMBER OF CLINIC ATTENDANCES BY GESTATION AT BOOKING IN THE ADMITTED GROUP

	1	2	3	4	5	6	7	8	Total
Not admitted	97 *14.5** *57.4+*	67 *10.0* *48.6*	117 *17.4* *59.4*	75 *11.2* *47.5*	102 *15.2* *58.3*	75 *11.2* *50.0*	66 *9.8* *45.5*	72 *10.7* *42.4*	671 *51.5*
Admitted	72 *11.4* *42.6*	71 *11.3* *51.4*	80 *12.7* *40.6*	83 *13.2* *52.5*	73 *11.6* *41.7*	75 *11.9* *50.0*	79 *12.5* *54.5*	98 *15.5* *57.6*	631 *48.5*
Total	169 *13.0*	138 *10.6*	197 *15.1*	158 *12.1*	175 *13.4*	150 *11.5*	145 *11.1*	170 *13.1*	1302 *100*

TABLE V/XIV : ADMISSION RATES BY CONSULTANT

* Row percentage (χ^2 Test significant at 5% level)

\+ Column percentage

	1 PPND	⩾2 PPND	Total
Not admitted	9	3	12 *36.4%**** *(1.7%)*
Admitted	20	1	21 *63.6%**** *(3.4%)*
Total group	29	4	33 *100%* *(2.5%)*

TABLE V/XV : INCIDENCE OF PREVIOUS PERINATAL LOSS IN THE NON-ADMITTED AND ADMITTED GROUPS

(*** p <0.001)

(percentages in brackets = percentages of non-admitted, admitted or total groups)

	0	1	⩾2	Total
Not admitted	570 *84.9*	83 *12.4*	18 *2.7*	671 *100%*
Admitted	523 *82.9*	84 *13.3*	24 *3.8*	631 *100%*

TABLE V/XVI : INCIDENCE OF PREVIOUS SPONTANEOUS ABORTION IN THE NON-ADMITTED AND ADMITTED GROUPS

CHAPTER VI - THE WOMEN STUDIED - CURRENT PREGNANCY COMPLICATIONS

Since pre-existing risk factors seem relatively unimportant in causing antenatal admissions to hospital, the vast majority of admissions must be prompted by complications which arise during the course of the pregnancy. The most commonly occurring problems are not necessarily the same ones which most commonly result in antenatal admissions; these two questions will therefore be considered separately. Firstly, all complications noted and their relative frequencies of occurrence will be examined. Next, those complications most frequently responsible for antenatal admission to hospital will be identified; as has already been noted these will inevitably be current pregnancy complications. These two lists will be compared to see whether those complications most commonly occurring are also those responsible for most admissions. Common complications not causing admission, although not the major concern of this study, will be considered briefly. Those complications or groups of complications most commonly causing admission, their management and outcome will then be considered in detail in subsequent chapters.

A. Complications most commonly encountered

For the sample of 1302 women, 3987 complications were recorded. Some complications were coded on more than one occasion for the same woman; if each complication is counted only once for any particular woman, the total number of complications recorded was 3523. One hundred and twenty-four women (9.5% of the total group) had no complications recorded; the remaining 1178 women, therefore, had an average of three complications per woman. Parity did not affect this complication rate, the rates being 2.9 complications per

woman for primiparae and 3.1 complications per woman for multiparae.

Of the list of 70 possible complications shown in the appendix, six were never recorded; a further 115 complications were noted and coded as "other". Thus, in total, 179 complications were encountered and were responsible for the 3523 codings noted. Sixty-five of these diagnostic codes related to pre-existing risk factors and were responsible for 811 (23.0%) of the complications recorded. The remaining 2712 (72.0%) problems recorded were due to 114 complications which arose during the course of the pregnancy. This breakdown of complications is summarised in Figure VI/I. Since pre-existing risk factors have already been discussed (those discussed accounting for 513 (63.3%) of all complications due to pre-existing risk factors) only current pregnancy problems will be considered here.

There were 70 diagnoses for current pregnancy complications coded as "other"; these were responsible for the coding of 181 complications. Thus the 44 specifically coded current pregnancy complications from the full list in the appendix were responsible for 2531 complications (93.3% of current pregnancy problems). Thirty of these problems occurred in $\geqslant$1% of the women in the study group and were responsible for the coding of 2462 (90.8%) of these problems while 14 diagnoses occurred in $\geqslant$5% of the women and were responsible for the coding of 1963 complications (72.4% of current pregnancy problems). Figure VI/II summarises this data. Thus, as was expected, the majority of problems were due to a relatively small number of complications. The 14 diagnoses responsible for 72.4% of

current pregnancy problems are listed in Table VI/I in order of frequency. Only five of these complications were not among those most commonly resulting in antenatal admission; thus, the majority of commonly occurring complications were also commonly responsible for antenatal admission to hospital. The five exceptions encountered here are high weight gain, low weight gain, vaginal infection/ discharge, asymptomatic bacteriuria and anaemia (haemoglobin <10g/100ml).

Common complications not commonly treated by admission

(i) High and low weight gain

Weight gain in pregnancy is influenced by many factors such as age, parity, height, pre-pregnancy weight, social class and dietary manipulations as well as pathological conditions of pregnancy. Although measurement of weight at the antenatal clinic is not performed in controlled conditions, and is consequently subject to various errors and inaccuracies, it has long been traditional to weigh pregnant women at every clinic attendance with weight gain being regarded as of prognostic significance in the development of some complications. Thus for primigravidae the incidence of pre-eclampsia rises with higher weight gains while the incidence of low birth weight babies is highest with the lowest weight gains (Hytten and Chamberlain, 1980a). Similarly, it has been shown that the rate of weight gain between 20 and 30 weeks gestation gives some indication of the subsequent incidence of albuminuria (Thomson and Billewicz, 1957; MacGillivray, 1961). While "normal" values for weight gain can be established by such correlations with the incidence of pregnancy complications, the range of weight gain associated with a normal pregnancy course is

very large; thus while epidemiologically weight gains outwith the "normal" range may have statistical significance in predicting some complications, such prognostic value does not apply for the individual pregnant woman. Consequently, many clinicians are largely abandoning traditional practices and weigh pregnant women on a much less frequent basis.

For the purpose of this study, weight gain was described as high, normal or low on the basis of rates of weight gain between 20 and 30 weeks geatation. (High weight gain = $\geqslant$0.55kg/week; normal weight gain = $\geqslant$0.33 kg <0.55 kg/week; low weight gain = < 0.33 kg/week.) Allocation to the categories of high or low weight gain does not imply abnormality and the recording of these factors does not necessarily constitute a "complication"; indeed, very rarely was there any comment made in the case records regarding weight gain and only three women in the whole sample were admitted to hospital because of weight gains which were regarded as abnormal (two women with weight gains considered abnormally low both delivered term infants of normal weight for gestation; one woman whose weight gain was considered abnormally high had a similar normal pregnancy outcome).

These "complications" therefore should be regarded rather as additional descriptive data, recorded with the thought that it might prove significant in the discussion of the relevant pregnancy complications. This did not prove to be the case and there was no difference in the distribution of recorded weight gains in the hypertensive or low birth weight groups compared to the group

as a whole.

(ii) Vaginal infection/discharge

During the course of their pregnancies, 131 women (10.1%) were noted to have an abnormal vaginal discharge apparently due to vaginal infection. In the vast majority the cause was an infection due to candida albicans or trichomonas vaginalis or a combination of both. In five cases the symptoms were sufficiently severe to warrant treatment as inpatients but for the remaining 126 women appropriate therapy on an outpatient basis proved quite adequate.

(iii) Asymptomatic bacteriuria

Asymptomatic bacteriuria, defined as the finding on culture of the urine of $>10^5$ organisms/ml in the absence of symptoms of urinary tract infection, occurred in 107 women (8.2%). There was no difference in incidence in primiparae (7.3%) and multiparae (8.9%). While never directly the cause of antenatal admission to hospital, this condition is discussed later in conjunction with the problem of urinary tract infection.

(iv) Anaemia

At some point during their pregnancy, 69 women (5.3%) had a haemoglobin level of less than 10g/100 ml recorded. The incidences of 5.6% in primiparae and 5.1% in multiparae are not significantly different. The World Health Organisation's figure for the mean minimum normal haemoglobin level in pregnancy is 11.0g/100 ml (Hytten and Chamberlain, 1980b). The range of haemoglobin level compatible

with health is wide with the actual haemoglobin level also reflecting changes in plasma volume, and the criterion for the diagnosis of iron deficiency should be the presence of microcytosis. Nevertheless, a haemoglobin level of <10g/100 ml would generally be considered abnormal and for the purposes of this study was taken to indicate anaemia, usually due to iron deficiency.

This incidence of anaemia is despite a hospital policy of oral iron supplements for all women in pregnancy. On their own admission, however, many of these women either fail to take iron therapy or take it on a very erratic basis. Routine iron supplements in pregnancy has been the subject of debate (BMJ, 1978); some studies have shown no benefit from such blanket therapy (Paintin et al, 1966) while others suggest that it may be positively harmful (Nelson and Forfar, 1971) and the gastrointestinal side effects of nausea and constipation can be troublesome and unpleasant.

Five of the 69 anaemic women in this study group were admitted for investigation and management on an inpatient basis, either by monitoring the haematological response to supervised oral therapy or by administration of parenteral iron therapy with folic acid supplementation where such deficiency was demonstrated. The majority, however, were satisfactorily treated as outpatients by administration of either standard or increased doses of oral iron with folate supplements where appropriate and by emphasising the need for treatment where non-compliance appeared to have been a factor.

Many of the women, therefore, would not appear to regard routine iron therapy as important; compliance is consequently often poor but improves when a definite need for therapy can be demonstrated as evidenced by the success with simple measures in the majority of the anaemic women. Since the benefits of routine iron supplementation for all pregnant women are questionable, it would seem rational to limit treatment to those women with demonstrable iron deficiency; a more emphatic approach to therapy would then be possible and would hopefully lead to improved compliance.

B. Complications commonly treated by admission

Six hundred and thirty-one of the 1302 women were admitted at least once during their pregnancies and spent a total of 5077 days in hospital antenatally, an average of 8.0 days per woman. The total number of admissions for these women was 965, an average of 5.3 days per admission. Table VI/II shows that of the 631 (48.5%) women admitted, 501 (38.5%) spent from 1-10 days in hospital antenatally and 130 (10.0%) were admitted for more than 10 days. Nine women (1.5%) spent 6 weeks or more in hospital while 3 women were admitted for a total of more than 100 days. Table VI/III shows the numbers of admissions experienced by those women; this did not vary with parity.

Table VI/IV shows the referral source of these admissions. Self-referral and arranged admission via the antenatal clinic together accounted for 95% of all admissions with self-referral (68%) making by far the biggest contribution. Very few admissions (2.8%) resulted from general practitioner referral to hospital

while 18 women (1.8%) were transferred from another hospital where they were already inpatients.

Of the total 179 complications encountered in this study, 100 resulted in admission on at least one occasion. Fifty of these were among the specifically coded diagnoses in the appendix and resulted in 902 (93.5%) admissions; the remaining 50 were among those coded as "other" and resulted in 63 (6.5%) admissions. Sixteen complications were each responsible for ⩾1% of all admissions and in total were responsible for 761 (78.9%) admissions. These frequencies of admission for the various complications are shown in Figure VI/III. Some women were admitted more than once with the same complication and some had multiple admissions due to different complications. Counting an admission due to a particular complication only once per woman, the same 16 diagnoses were each responsible for the admission of ⩾1% of the women. These diagnoses are listed in Table VI/ V, the order of frequency being numbers of women admitted. Some complications resulted in brief antenatal admissions while for others the subsequent inpatient stay was of longer duration; however, many women once admitted with one complication developed other problems which prolonged their admission. The entire duration of an antenatal admission, therefore, could not always be attributed to the initiating complication; nevertheless, it is interesting to consider the complications in terms of numbers of days admission apparently attributable to them. Fourteen complications each accounted for ⩾1% of the total number of inpatient days and these are listed in Table VI/VI. Thirteen of these are also among those complications causing most admissions.

Thus a few complications result either in a large number of women being admitted for brief periods or in a small number of women being admitted for prolonged periods. In the first category are suspected spontaneous rupture of membranes and reduced fetal movements, both conditions tending to lead either to early delivery or discharge from hospital undelivered. Conversely, multiple pregnancy resulted in the admission of only five women (18 women in the group had twin pregnancies) but all of these women spent a considerable time in hospital.

It is, therefore, apparent that of all the complications resulting in antenatal admissions, only a small minority are of numerical significance in terms of number of admissions, number of women admitted and number of antenatal inpatient days apparently attributable to these complications. The 13 such complications, all of which are current pregnancy problems, fall into general groups each of which will be studied in greater detail.

Main categories of complications

It was apparent on inspecting the case notes that a common presenting complaint was abdominal pain, the aetiology of which was often not immediately obvious. While sometimes no diagnosis was suggested, more commonly either a renal or uterine origin was initially postulated. For some women a definitive diagnosis was made and either labour and delivery ensued or a urinary tract infection was demonstrated or sometimes labour occurred in the presence of a urinary tract infection. In many cases, however, the diagnosis remained obscure and considerable movement occurred

between the different diagnostic categories when observation or investigation failed to confirm the initial diagnosis. Empirical treatment was often instituted; the inclusion in the preterm labour category of those women who were given treatment to suppress labour and did not progress to delivery does not necessarily imply that the initial diagnosis was correct. It was also apparent that many of those women in whom a definitive diagnosis was never made had recurrent admissions with the same indefinite complaints and posed considerable diagnostic problems. Many of the women with vomiting also had abdominal pain and this combination of complaints often resulted in a proposed diagnosis of UTI. Consideration as a group will, therefore, be given to those complications coded as preterm labour, non-progressive uterine activity at varying gestations, suspected and confirmed urinary tract infections and abdominal pain of undetermined aetiology under the general heading of abdominal pain; vomiting, because of its association with these conditions, will also be considered in this group and the relationship of asymptomatic bacteriuria to urinary tract infections will also be examined.

Three of the 13 complications relate to hypertension; the problem of hypertension in pregnancy will, therefore, be considered as a whole with inclusion of all diagnostic codes relating to this condition. Two of the complications concern bleeding in pregnancy and this problem will similarly be considered as a whole. The fourth condition to be examined will be intrauterine growth retardation; included in this study will be not only those women

where intrauterine growth retardation was suspected, whether or not this proved to be the case, but also those women whose babies were in fact growth retarded but where this was not suspected antenatally.

As noted, there were 18 women in the study sample with multiple (twin) pregnancies; because of the additional problems peculiar to twin pregnancies these have been omitted from the following discussions. Data relating to management of specific complications thus refers only to singleton pregnancies.

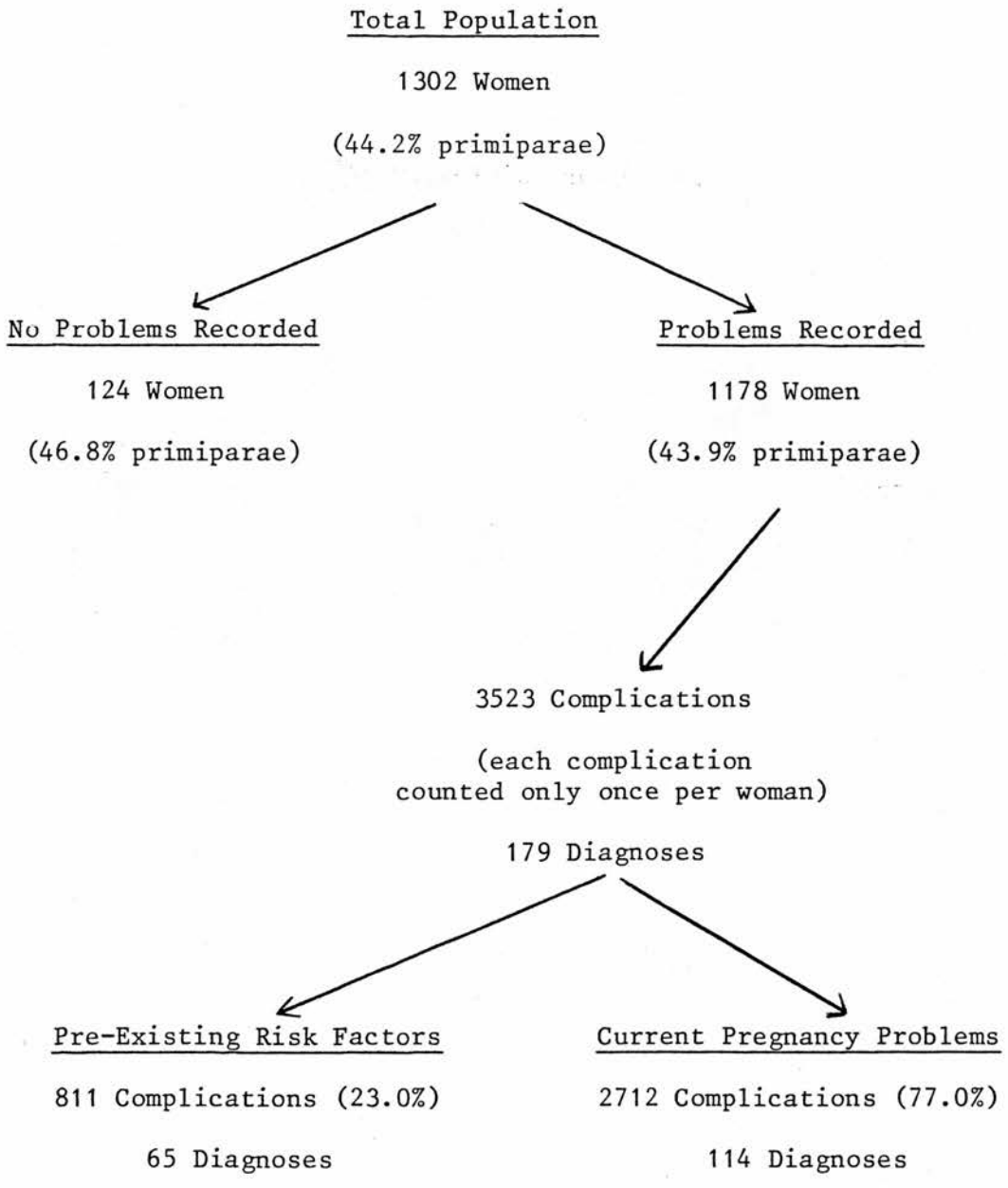


FIGURE VI/I : RELATIVE IMPORTANCE OF DIAGNOSTIC CODES IN TERMS OF TYPE OF COMPLICATION

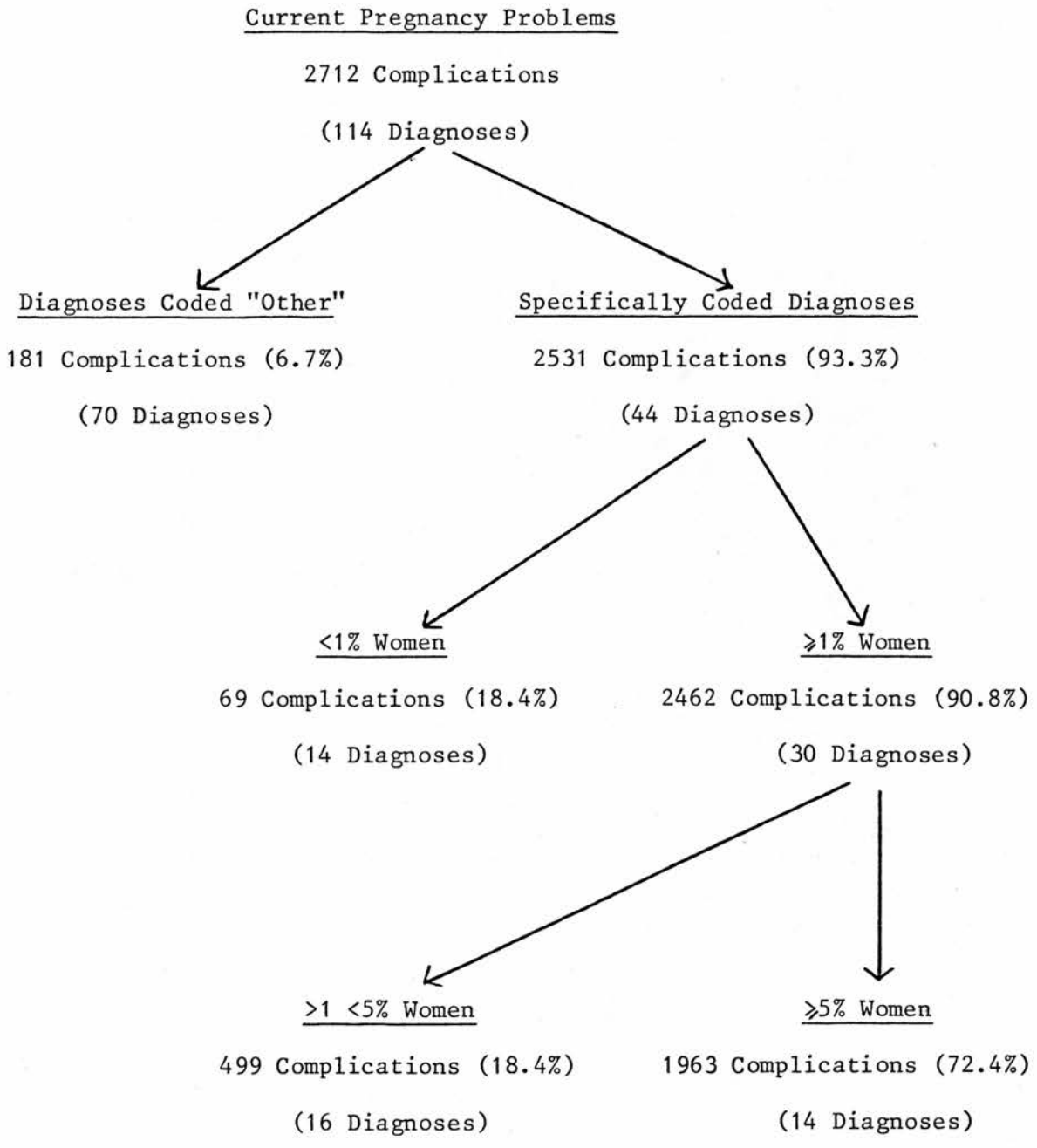


FIGURE VI/II : RELATIVE IMPORTANCE OF DIAGNOSTIC CODES IN CURRENT PREGNANCY COMPLICATIONS IN TERMS OF NUMBERS OF AFFECTED WOMEN

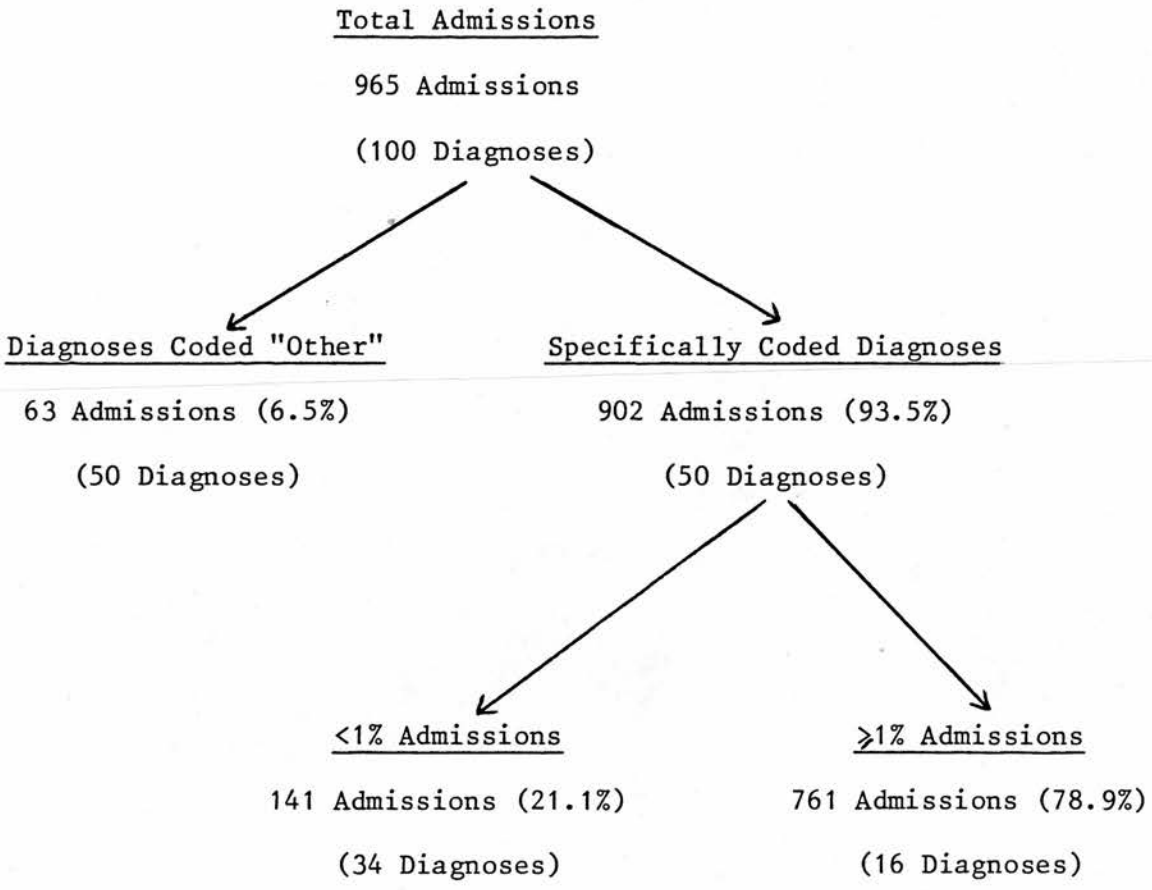


FIGURE VI/III : RELATIVE IMPORTANCE OF DIAGNOSTIC CODES IN TERMS OF NUMBERS OF ADMISSIONS

DIAGNOSIS	No. of prims	No. of multips	Total no. of women
High weight gain ⩾0.55 kg/week 20-30 weeks gestation	164	164	328
Suspected urinary tract infection - not confirmed	127	118	245
Low weight gain <0.33 kg/week 20-30 weeks gestation	95	140	235
Pregnancy induced hypertension no proteinuria, diastolic BP ⩾90⩽95 mmHg	105	86	191
Non-progressive uterine activity ⩾37 weeks	87	102	189
Vaginal infection/discharge	64	67	131
Asymptomatic bacteriuria	42	65	107
Threatened abortion <24 weeks	46	48	94
Suspected intrauterine growth retardation	40	45	85
Vaginal bleeding ⩾24 weeks of undetermined aetiology	45	31	76
Pregnancy induced hypertension no proteinuria, diastolic BP >95<110 mmHg	36	34	70
Abdominal pain of undetermined aetiology	31	38	69
Anaemia (Hb<10g/100 ml)	32	37	69
Preterm labour <37 weeks (progressive ±treatment, or non-progressive + treatment)	27	38	65

TABLE VI/I : MOST COMMONLY ENCOUNTERED CURRENT PREGNANCY COMPLICATIONS

	No. of Antenatal Inpatient Days			
	0	1-10	>10	Total
No. of women	671	501	130	1302
	(51.5%)	*(38.5%)*	*(10.0%)*	*(100%)*

TABLE VI/II : DURATION OF ANTENATAL ADMISSIONS BY NUMBERS OF WOMEN

	No. of Admissions					
	0	1	2	3	⩾4	Total
No. of women	671	428	142	40	21	1302
	(51.5%)	*(32.9%)*	*(10.9%)*	*(3.1%)*	*(1.6%)*	*(100%)*

TABLE VI/III: NUMBER OF ANTENATAL ADMISSIONS PER WOMAN

	Home (self-referral)	Ante-natal clinic	Other hospital	G.P.	Other	Total
No. of admissions	656	261	18	27	3	965
	68.0%	*27.0%*	*1.9%*	*1.8%*	*0.3%*	*100%*

TABLE VI/IV: SOURCE OF ADMISSION

DIAGNOSIS	No. of prims	No. of multips	Total no. of women
Non-progressive uterine activity ⩾37 wks	86	100	186
Vaginal bleeding ⩾24 wks of undetermined aetiology	35	25	60
Suspected urinary tract infection - not confirmed	34	23	57
Preterm labour <37 wks (progressive ±treatment/non-progressive + treatment)	24	32	56
Pregnancy induced hyptertension, no proteinuria, diastolic BP ⩾90⩽95 mmHg	30	24	54
Abdominal pain of undetermined aetiology	23	28	51
Non-progressive uterine activity <37 wks gestation	18	26	44
Pregnancy induced hyptertension, no proteinuria, diastolic BP >95<110 mmHg	20	17	37
Suspected spontaneous rupture of membranes. Not in labour ⩾37 wks gestation	13	17	30
Threatened abortion <24 wks	16	13	29
Confirmed urinary tract infection	15	10	25
Vomiting	12	10	22
Suspected spontaneous rupture of membranes. Not in labour, 33-37 wks gestation	12	7	19
Reduced fetal movements	10	8	18
Suspected intrauterine growth retardation	6	8	14
Chronic hyptertension	5	8	13

TABLE VI/ V : COMPLICATIONS MOST COMMONLY CAUSING ADMISSION AND NUMBERS OF WOMEN ADMITTED

DIAGNOSIS	No of inpatient days
Non-progressive uterine activity ≥37 weeks gestation	446
Threatened abortion <24 weeks gestation	339
Abdominal pain of undetermined aetiology	330
Suspected urinary tract infection - not confirmed	305
Vaginal bleeding ≥24 weeks gestation of undetermined aetiology	299
Confirmed urinary tract infection	259
Vomiting	243
Preterm labour <37 weeks gestation (progressive ± treatment/non progressive + treatment)	237
Pregnancy induced hypertension, no proteinuria, diastolic BP >95<110 mmHg	207
Pregnancy induced hypertension, no proteinuria, diastolic BP ≥90≤95 mmHg	206
Multiple pregnancy	176
Suspected intrauterine growth retardation	150
Chronic hypertension	129
Non-progressive uterine activity <37 weeks gestation	104

TABLE VI/VI: COMPLICATIONS RESULTING IN GREATEST NUMBER OF INPATIENT DAYS

CHAPTER VII - MANAGEMENT OF SPECIFIC PROBLEMS : ABDOMINAL PAIN

Abdominal pain does not represent a clinical entity but may be the presenting symptom in a number of clinical situations; when considered in conjunction with other features of the history it may appear to indicate a specific diagnosis which, on further observation or investigation, may or may not be confirmed. In obstetric practice it is commonly interpreted by the woman or her medical attendants as indicating the onset of labour with the diagnosis of urinary tract infection another commonly proposed explanation; on many occasions, however, the features of the pain are rather non-specific and not suggestive of any particular diagnosis.

The situation where labour is suspected and the pregnancy is at term poses no major clinical problem but is of importance since, where the diagnosis proves unfounded, it may result in an inpatient stay of variable duration; while such hospitalisation may result from the unconfirmed diagnosis of labour at earlier gestations, the diagnosis of preterm labour is of clinical importance because of the risk to the fetus of early delivery. Liston and Patel (1985) stated that the 6-8% of pregnancies which deliver preterm account for 75% of perinatal deaths with 10% of survivors suffering some sort of handicap. Thus while spontaneous progressive labour at $\geqslant$37 weeks gestation is a normal event, such labour occurring at <37 weeks was recorded as a pregnancy complication.

Urinary tract infection (UTI) is a common medical complication of pregnancy; whether symptomatic or asymptomatic, such infection has been causally linked with an increased rate of pregnancy

complications including an increase in perinatal mortality and morbidity largely from low birthweight due to prematurity or low birthweight for gestational age and an increased rate of hypertensive disorders and anaemia (Kass, 1962; Kincaid-Smith and Bullen, 1965; McFadyen et al, 1973; Brumfitt, 1975; Naeye, 1979; McGrady et al, 1985). Other authors, however, do not confirm these associations (Little, 1966; Whalley, 1967; Dixon and Brant, 1967; Beard and Roberts, 1968; Lawson and Miller, 1971; Gilstrap et al, 1981). While there is general agreement concerning the increased risk of urinary tract infection in pregnancy in women with asymptomatic bacteriuria, the value of screening for such bacteriuria to predict and prevent subsequent UTI is questioned (Dixon and Brant, 1967; Lawson and Miller, 1971; Swapp, 1973; Chng and Hall, 1982).

Abdominal pain was an extremely common problem encountered in this study; pain due to false labour both at term and preterm, pain due to progressive preterm labour, pain attributed to urinary tract infection, both confirmed and unconfirmed, and abdominal pain with no obvious aetiology were all among the complications listed in Chapter VI as most commonly resulting in hospital admission. Of the women with singleton pregnancies, 488 had one or more and in total 757 episodes of pain. Of these, 350 had at least one and in total 460 antenatal admissions initiated by abdominal pain of one or more of these categories. As might be imagined, these admissionsalmost invariably followed self-referral. These 460 admissions resulted in a total of 1681 inpatient days (33.1% of the total inpatient days for the whole group). On inspection of the case records, it was apparent that as a result

of observation or investigation after admission, the initial diagnosis often proved unfounded and an alternative diagnosis was then suggested; moreover, a number of women had multiple admissions with abdominal pain, often attributed to different conditions on different occasions and often without any ultimate definitive diagnosis. It therefore seems appropriate to consider these various complications as a group, not only because abdominal pain was the presenting symptom common to all but also because of the movement between these diagnostic categories and the frequency with which women experienced recurrent episodes attributed to different aetiologies. Asymptomatic bacteriuria by definition does not present with abdominal pain and in this study never caused antenatal admission to hospital; however, because of the relationship it is claimed to have with urinary tract infection and with the obstetric complications already mentioned, it is considered here in conjunction with the overall problem of abdominal pain. In the following discussion, episodes of illness rather than individual women are considered. Each category includes women with recurrent episodes of abdominal pain all attributed to the same cause and for each category the number of women as well as the number of episodes is given. Those women, however, who had recurrent episodes of pain attributed to different causes on different occasions appear in more than one category; thus 96 women are included in two categories while five women appear in all three.

Abdominal pain attributed to labour

As one would expect, all 277 women whose abdominal pain was interpreted in this way (Figure VII/I) were either admitted to hospital or were already inpatients for other reasons. These 277 women each had from one to four episodes and in total 325 episodes of such abdominal pain. Sixty-three of these women also had other episodes of pain attributed to urinary tract infection and 16 had episodes of pain of undetermined aetiology while five women had pain of both kinds at different times; thus 79 of these women are included in the numbers for one other category while five appear in all three categories. There were 119 episodes of pain attributed to labour at <37 weeks gestation. Intravenous ritodrine was sometimes administered in an attempt to suppress labour and among the women with two such episodes, ritodrine was variously given on one or other or both or neither occasion. Such variations in management did not appear to be due to differences in the clinical situation but rather to differing views of clinicians in the absence of a uniform management policy. Thus, while it would appear that in these very small groups rather more of the non-progressive episodes were treated with ritodrine, even had the numbers been much larger, the non-comparable nature of these episodes precludes any conclusions on the efficacy of ritrodine in suppressing preterm labour. Once it became clear that preterm labour was not progressive, in 20 cases a urinary tract infection was proposed as an alternative explanation for the pain. In one case the diagnosis was confirmed bacteriologically and treated; the other 19 women all had sterile urine but despite this two of these women were also treated with antibiotics (Figure VII/I).

Of the 206 episodes of pain attributed to labour ⩾37 weeks, none proved progressive since, as already noted, spontaneous labour at term was not recorded as a pregnancy complication. After observation for one or more days 28 of these women were electively delivered because of their admission with false labour. This may reflect anxieties that the pain was due to a minor degree of placental abruption although in all these cases fetal monitoring was satisfactory; alternatively, delivery may have been merely a matter of convenience for the women or the medical staff. Whatever the reasons, however, the selection of women for delivery appeared arbitrary as judged from the information available in the case records. In 19 other cases a diagnosis of UTI was subsequently proposed; in four cases the diagnosis was confirmed but nevertheless one of these women did not receive the appropriate antibiotic therapy (Figure VII/I).

Abdominal pain attributed to urinary tract infection

Two hundred and forty-eight women had from one to six and in total 345 episodes of pain thought to be due to UTI (Figure VII/II). Seventeen also had, at different times, pain of undetermined aetiology while, as already noted, 63 had pain thought to be due to labour and five had pain attributed to both these diagnostic groups; thus 80 are included in the totals for one other group while the other five women appear in all three groups. One hundred and fifty-four of these episodes were managed on an inpatient basis. In 89 admission was specifically because of suspected UTI while 65 women were already inpatients when they developed pain. Of the women with recurrent suspected UTI, some were admitted on one or

some or all or none of these occasions while, as already noted, 85 also had episodes of pain attributed to different diagnoses, some of which resulted in admission; thus of the 248 women with suspected UTI, 147 were admitted on at least one occasion because of some kind of abdominal pain.

In most cases, the suspected diagnosis of UTI prompted investigation by urine culture. In 22 of the outpatient episodes, however, this was not the case but in 12 of these antibiotic therapy was empirically given. Of the remaining episodes managed without admission, culture of a midstream specimen of urine (MSSU) was negative in 115 cases, in two of which antibiotics were nevertheless prescribed. Of the 54 cases in which the diagnosis was bacteriologically confirmed, 22 were not treated with antibiotics while the remaining 32 were. Following treatment, a further MSSU was sometimes sent for culture but often no check was made to ensure the infection had been eradicated; in 13 of the confirmed and treated infections, however, a further urine sample after treatment was positive on culture but no further action was taken.

Seven of the inpatient episodes were not investigated by urine culture; of these, two were empirically treated with antibiotics while in one a diagnosis of labour was subsequently suggested. Although progressive labour did not ensue, the woman, who was >37 weeks gestation, was electively delivered. Of the 102 inpatient cases where urine was sterile on culture, six were nevertheless treated with antibiotics while in a further six preterm

labour was then suspected proving progressive in two. Of the 45 inpatient cases where UTI was bacteriologically confirmed, eight did not receive antibiotic therapy while, of the 37 who did, twelve still had a positive urine culture after treatment for which no further action was taken.

Thus in total 22 episodes of suspected UTI were treated with antibiotics in the absence of bacteriological evidence of infection. Conversely, of the 99 episodes where infection was confirmed, 55 received either no treatment or treatment which was shown to be inadequate; furthermore, it cannot be stated that the remaining 44 were adequately treated since in many cases urine culture was not checked after treatment. In addition to these 99 episodes of UTI, five occurred in the group where the initial diagnosis was labour and two in the category of pain of undetermined aetiology (Figure VII/III). These 106 episodes of UTI were experienced by 64 women of whom 11 had no treatment at any time while 14 had inadequate treatment in that they were shown to have a positive urine culture after completing therapy either as an asymptomatic bacteriuria or as a further symptomatic UTI which was not treated. Twenty-eight women had treatment which may or may not have been effective but post treatment urine culture was not carried out. Thus only 11 (17.2%) of the 64 women had treatment which was bacteriologically proven to have eradicated the infection while 25 (39.1%) had either no treatment or treatment which was shown to be inadequate.

Abdominal pain of undetermined aetiology

Sixty-nine women suffered 87 episodes of abdominal pain not

thought to be suggestive of either labour or UTI and all the women were admitted for at least one episode, with 76 episodes being managed on an inpatient basis, the women being either admitted specifically because of the pain or developing it while an inpatient for some other reason (Figure VII/III). As noted, 17 also had other episodes of pain attributed to UTI and 16 had pain attributed to labour while five had other episodes of pain variously attributed to each of these causes. In 11 episodes the pain was not considered sufficiently severe to warrant admission to hospital; no investigations were carried out, no action was taken and the complaint was simply recorded in the case records. Of the 76 episodes managed on an inpatient basis, 42 were not investigated but were simply observed in hospital. In a further 29 cases observation after admission prompted the diagnosis of UTI. Investigation confirmed this in two cases, only one of which was treated while three women with sterile urine were given antibiotic therapy. The remaining five women were all delivered because of their abdominal pain but in none was any cause for the pain identified.

Asymptomatic Bacteriuria

In the sample of 1302 women 107 (8.2%) had asymptomatic bacteriuria of $>10^5$ organisms/ml on culture of a single midstream specimen of urine carried out as a screening test at booking. Seventeen (15.9%) of these women then received antibiotic therapy of whom 11 did not have a further urine culture after treatment to confirm eradication of the infection. Six women did have further urine cultures, three because they developed symptoms thought to be due to UTI. In all six cases culture was again positive but only

two women, both with symptomatic infections, received further treatment; one of these two women had a further urine culture carried out after her second course of antibiotics and although this was again positive no further treatment was given.

Ninety (84.1%) women with asymptomatic bacteriuria did not receive antibiotic therapy. Fifty-seven had no subsequent urine culture carried out although two later developed symptoms thought to be due to UTI and were empirically treated with antibiotics. Eight women subsequently had a number of episodes of abdominal pain variously diagnosed but in all at least one episode was attributed to urinary tract infection. All eight were shown to have sterile urine but one woman was nevertheless treated with antibiotics. The remaining 25 women, eight of whom remained asymptomatic throughout pregnancy, were all subsequently shown to have positive urine cultures. Three of the eight asymptomatic women were later treated with antibiotics; in two of these urine culture after treatment was carried out and in both cases remained positive. The remaining 17 women all developed at least one episode of symptomatic UTI later in pregnancy. Ten received antibiotic therapy for all episodes, six were treated for some episodes but not others while one woman never received antibiotics. Of these 17 women, two were shown to have sterile urine after treatment, ten had no further urine culture carried out and five still had a positive MSSU after completing a course of antibiotics. Thus of the 107 women with asymptomatic bacteriuria only 17 (15.9%) were initially treated while 39 (36.5%) received antibiotic therapy at some time during their pregnancy whether for asymptomatic or symptomatic infection.

Of those treated, however, only two were shown to have had their infection eradicated while in 12 treatment was demonstrated to be ineffective. Thus 73 (68.2%) women received either no or inadequate treatment. (Figure VII/IV)

In the total sample of 1302 women, 64 (5.4%) developed symptomatic urinary tract infections. Twenty (18.7%) of the 107 women (8.2% of the whole study group) with asymptomatic bacteriuria subsequently developed UTI compared to 44 (3.7%) of the 1195 women without bacteriuria. The rate of symptomatic infection was therefore five times greater among women with bacteriuria but conversely only 20 (31.3%) of the women who developed UTI had asymptomatic bacteriuria. It is worth noting, however, that 50 (46.7%) of the women with bacteriuria had one or more episodes of abdominal pain during their pregnancy. In 20 the diagnosis of UTI was confirmed and in a further eight the urine was shown to be sterile. Of the remaining 22 however, three had previously had antibiotic therapy but no urine culture after treatment nor when they later developed abdominal pain and two, not previously treated, were judged on clinical grounds to have a UTI and were treated with antibiotics in the absence of further bacteriological confirmation. Two women had repeated asymptomatic and untreated positive urine cultures throughout pregnancy yet the diagnosis of UTI was not considered when they subsequently developed abdominal pain for which no other cause could be found. The remaining 15 women had untreated asymptomatic bacteriuria in early pregnancy but no subsequent urine culture carried out and all developed abdominal pain later in pregnancy; four proved to have progressive preterm labour but in

the other 11 cases no investigations were carried out, no treatment given and no cause for the pain identified. It is thus possible that while the proven rate for urinary tract infection among women with asymptomatic bacteriuria was only 18.7%, appropriate bacteriological investigation might have revealed a somewhat higher rate.

In the total study group of 1302 women the preterm (<37 weeks) delivery rate was 6.4%. Of the 107 women with asymptomatic bacteriuria and the 64 with UTI, five and three respectively delivered at <37 weeks. In the whole study group, 90 (6.9%) babies were of low birthweight (<2500g.) compared to six and two in the bacteriuric and UTI groups respectively; while these numbers are too small to be significant, there certainly does not appear to have been a greatly increased risk of preterm delivery or low birthweight in association with urinary infection, either symptomatic or asymptomatic. Similarly an increased incidence in these two groups of hypertensive disorders and anaemia was not observed.

Vomiting

29 women in the study group had vomiting recorded as a complication on at least one occasion with five women having recurrent episodes of vomiting. In only four of the 29 women was vomiting recorded at a gestation of ≤14 weeks; thus it seems likely that more women may have had vomiting in early pregnancy which was not recorded, presumably since this is commonly regarded as a normal feature of pregnancy. Of the 29 women, 25 were treated on an inpatient basis with 22 admitted specifically for this indication.

These 22 women had 25 antenatal admissions for vomiting resulting in 243 inpatient days. Nineteen of the 29 women with vomiting also had abdominal pain recorded as a complication. In 17 this was attributed to urinary tract infection but only two of these women had this diagnosis confirmed (Figure VII/V). A further two women had had four and three previous episodes of confirmed symptomatic UTI; the first three and two episodes respectively were either not treated or treated ineffectively and in both cases urine culture after treatment of the final episode was not carried out. The former, on admission with vomiting and abdominal pain, was suspected of having UTI but her urine was sterile on culture while in the latter, with the same presenting picture, this diagnosis was not considered and urine culture was not carried out. Interestingly, vomiting was not a feature of any of the seven proven episodes of infection experienced by these two women. A further three women had asymptomatic bacteriuria demonstrated in early pregnancy but not treated. At the time of admission with vomiting, two of these had sterile urine on culture while the third woman, despite the suspicion of UTI being raised, did not have urine culture carried out; since she later had a confirmed symptomatic UTI, her urine may well have been infected at the time of her admission with vomiting.

This study thus confirms that vomiting is commonly held to be associated with urinary tract infection and in almost all the cases presenting with vomiting and abdominal pain this diagnosis was proposed. Interestingly, however, the diagnosis of UTI was only confirmed in two cases and in none of the other 104 episodes of confirmed symptomatic UTI was vomiting a recorded feature.

Discussion

Clearly abdominal pain is a common complaint in pregnancy and as demonstrated by this study the various conditions which may be responsible pose difficulties of definition, diagnosis and treatment. In the case of preterm labour it is these problems of definition and diagnosis which have complicated attempts to assess the efficacy in preventing preterm labour of drugs which suppress uterine contractility. Anderson (1977) pointed out that of all women admitted preterm with regular painful uterine contractions, a single live fetus, no vaginal bleeding, intact membranes and an uneffaced cervix less than 2 cms dilated, only 25% will deliver preterm and it is not possible to distinguish these women from those in whom uterine contractions stop spontaneously. Given that clinicians experience such difficulty in diagnosing preterm labour, it is hardly surprising that this is also a problem for the pregnant women. Thus some fail to realise that they are indeed in labour and deliver before they reach hospital while many others, as demonstrated by this study, admit themselves to hospital as being in labour but do not progress to delivery. In preterm delivery the risks to the fetus make a false positive diagnosis especially preferable to a false negative one and there is no suggestion that women should be discouraged from attending hospital for assistance in making the diagnosis particularly when the pregnancy is preterm. The preterm (<37 weeks) delivery rate in this study of 6.4% agrees with previously reported rates (Butler and Bonham, 1963; Chamberlain et al, 1978; Liston and Patel, 1985). Many more women were admitted, however, who did not prove to be in preterm or term labour but who proceeded to spend variable periods of time, often quite prolonged,

as inpatients. Admission to hospital was generally followed by some form of fetal monitoring and where this is satisfactory and the pain settles spontaneously there seems little justification for prolonging the hospital admission. In some women with uncomplicated false labour at term the dilemma was resolved by elective delivery, possibly because of social factors or fears concerning the safety of the fetus; that any such risks were slight is suggested by the apparently arbitrary selection of women for delivery and the lack of detrimental effect of non-intervention on pregnancy outcome.

The diagnosis of urinary tract infection is similarly very difficult to make on clinical grounds. While a number of women have asymptomatic bacteriuria, conversely many with sterile urine will complain of symptoms suggestive of UTI (McFadyen et al, 1973). While the prevalence of asymptomatic bacteriuria will depend on diagnostic criteria such as the method of sample collection and number of cultures performed, the figure for this study of 8.4% based on a count of $>10^5$ organisms/ml on culture of a single midstream specimen of urine is in agreement with the published range of 4-8% (Kass, 1960; Turner, 1961; Kincaid-Smith and Bullen, 1965; Little, 1966; Dixon and Brant, 1967; McFadyen et al, 1973). Screening for treatment of asymptomatic bacteriuria is advocated as a means of reducing or eliminating urinary tract infection in pregnancy (Kass, 1960; Turner, 1961; Kincaid-Smith and Bullen, 1965; Little, 1966; Brumfitt, 1975; Harris, 1979; Gilstrap et al, 1981), but as already noted the value of such management is questioned on the grounds that although the risk of UTI is greater in bacteriuric women, many cases of UTI occur in non-bacteriuric women. A further

justification for treatment is the alleged association with certain pregnancy complications such as previously discussed; however, Kincaid-Smith and Bullen (1965), although confirming these adverse effects on pregnancy, were unable to reverse this trend by treatment. Although the numbers are small the results of this study show no increase in preterm delivery, low birthweight, hypertension or anaemia in women with asymptomatic bacteriuria or urinary tract infection; such an observation is unlikely to be due to treatment since few women were treated and even fewer treated effectively. While treatment of asymptomatic bacteriuria remains controversial this is not so for treatment of symptomatic urinary tract infection which is justified to reduce both immediate and long term maternal morbidity. In this study there were clearly problems not only in carrying out appropriate investigations but also in instituting appropriate therapy and follow up of patients.

While there are clearly problems in dealing with pain of proven aetiology and short lived pain of unknown aetiology, a greater problem in some respects is the pain of undetermined aetiology which does not quickly settle; such episodes of pain resulted in inpatient stays of variable duration but often prolonged and often recurrent. While 488 women experienced 757 episodes of pain with 350 women having at least one admission with a total of 460 admissions, in only 160 episodes of pain was a definite diagnosis made. Moreover, 366 women suffered 527 episodes of pain resulting in 321 antenatal admissions and none of these women for any of these 527 episodes of pain had any definite cause identified. Of the women with vomiting, many also had abdominal pain and this combination

of complaints often prompted a diagnosis of UTI; this diagnosis was rarely confirmed, however, and in this study vomiting was not recorded as a common feature of urinary tract infection. It is of interest that, as an incidental finding, a number of women with unexplained abdominal pain also complained of constipation. Constipation is common in pregnancy (Anderson, 1984) and can cause abdominal pain. It is not possible to tell whether treatment of constipation in these women was related to an improvement in their abdominal pain or merely co-incidental. Since constipation is common in pregnancy as is undiagnosed abdominal pain, it is possible that an altered bowel habit was at least a contributory factor in some of these episodes of pain. Increasing dietary fibre is an effective treatment for constipation in pregnancy (Anderson and Whichelow, 1985) and although within the population dietary habits vary greatly, by their own admission many of the women attending these antenatal clinics had a low intake of fibre. Although women are given dietary advice antenatally with specific reference to the benefits of a high level of dietary fibre, greater emphasis of this point may be required and this would seem to be an area meriting at least further study.

Thus this study shows how commonly abdominal pain complicates pregnancy and illustrates difficulties in diagnosis and treatment. Although no conclusion can be drawn regarding treatment of preterm labour, difficulties in diagnosing labour at any gestation are confirmed. Rates of asymptomatic bacteriuria and urinary tract infection are in agreement with other published work and results of this study support the view that there is no increased rate of

preterm delivery, low birth weight, hypertension or anaemia in association with either symptomatic or asymptomatic infection. Treatment of such infections was clearly unsatisfactory and more efficient administrative and management policies are necessary to improve both diagnosis and treatment. Such improvement might reduce both the number and duration of antenatal admissions. Apart from those episodes of pain for which a clearly defined cause was apparent, there were also many for which no cause was ever found. A significant number of women experienced recurrent episodes of such pain and as a result often spent considerable periods of time as inpatients; if such admissions are to be reduced further study will be necessary to try to identify the aetiological factors involved.

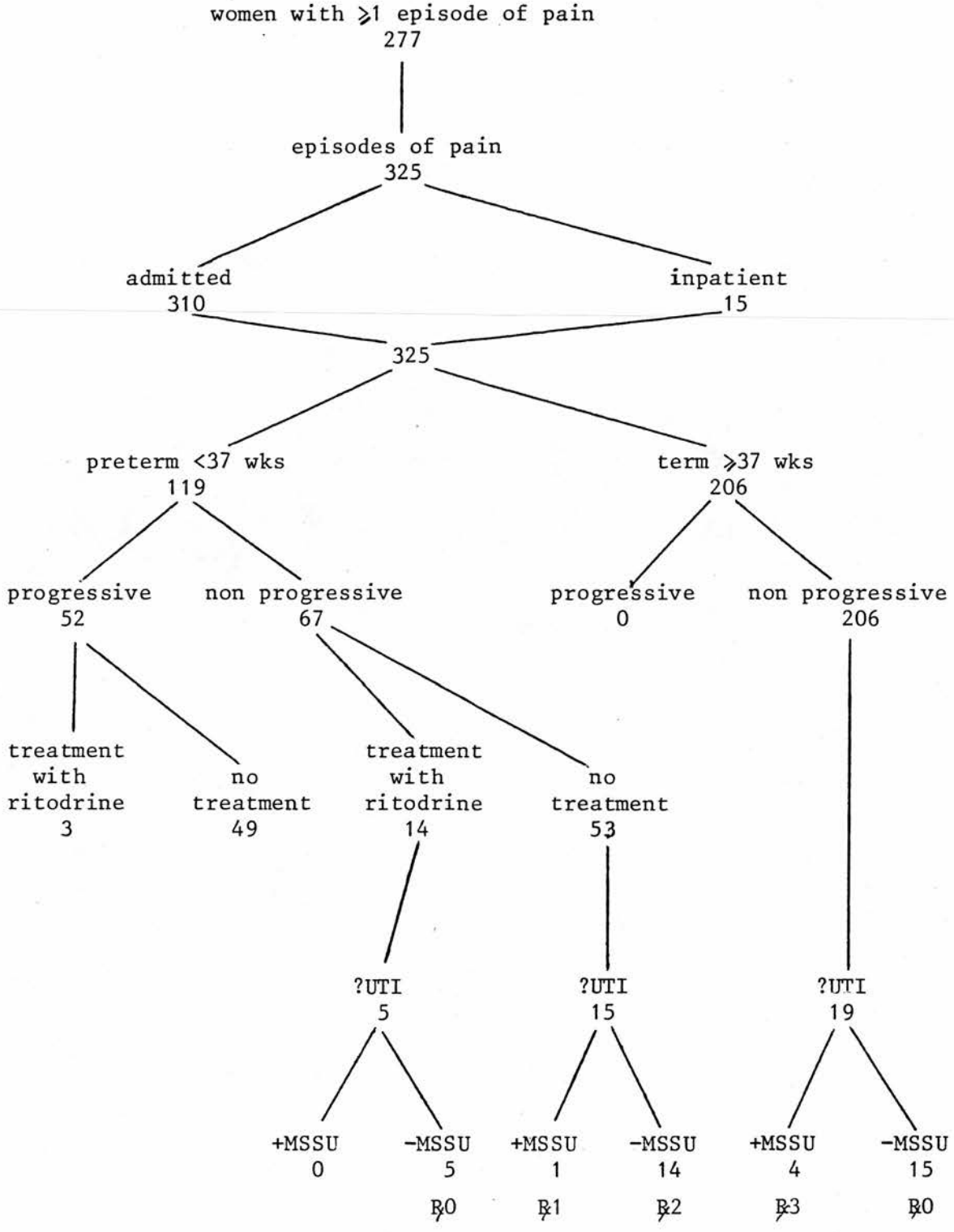
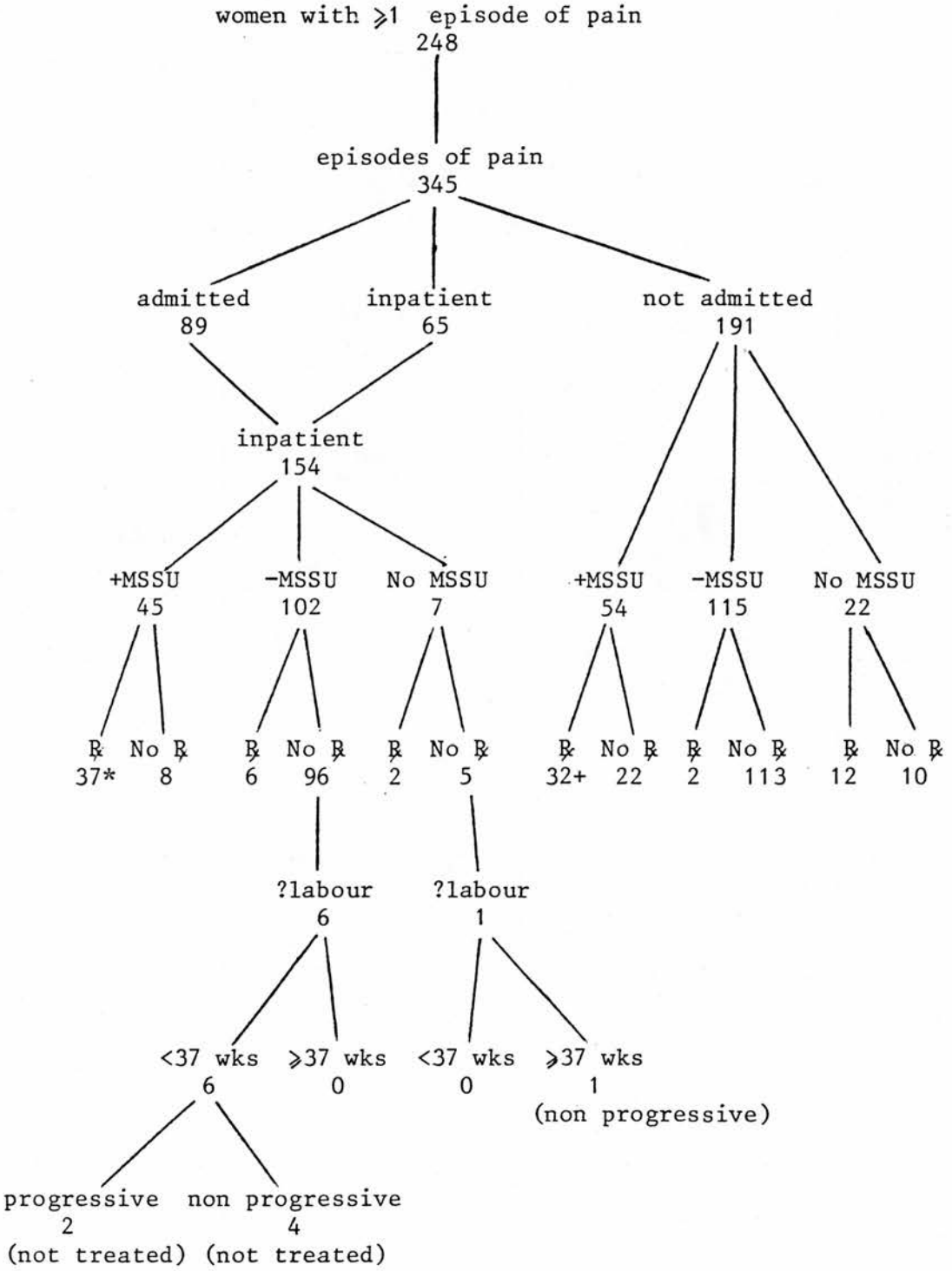


FIGURE VII/I : ABDOMINAL PAIN ATTRIBUTED TO LABOUR

(℞ = antibiotic treatment)



[*12 known to have a +MSSU after treatment but no further action taken]

[+13 known to have a +MSSU after treatment but no further action taken]

[℞ = antibiotic treatment; No ℞ = No antibiotic treatment)

FIGURE VII/II : ABDOMINAL PAIN ATTRIBUTED TO URINARY TRACT INFECTION

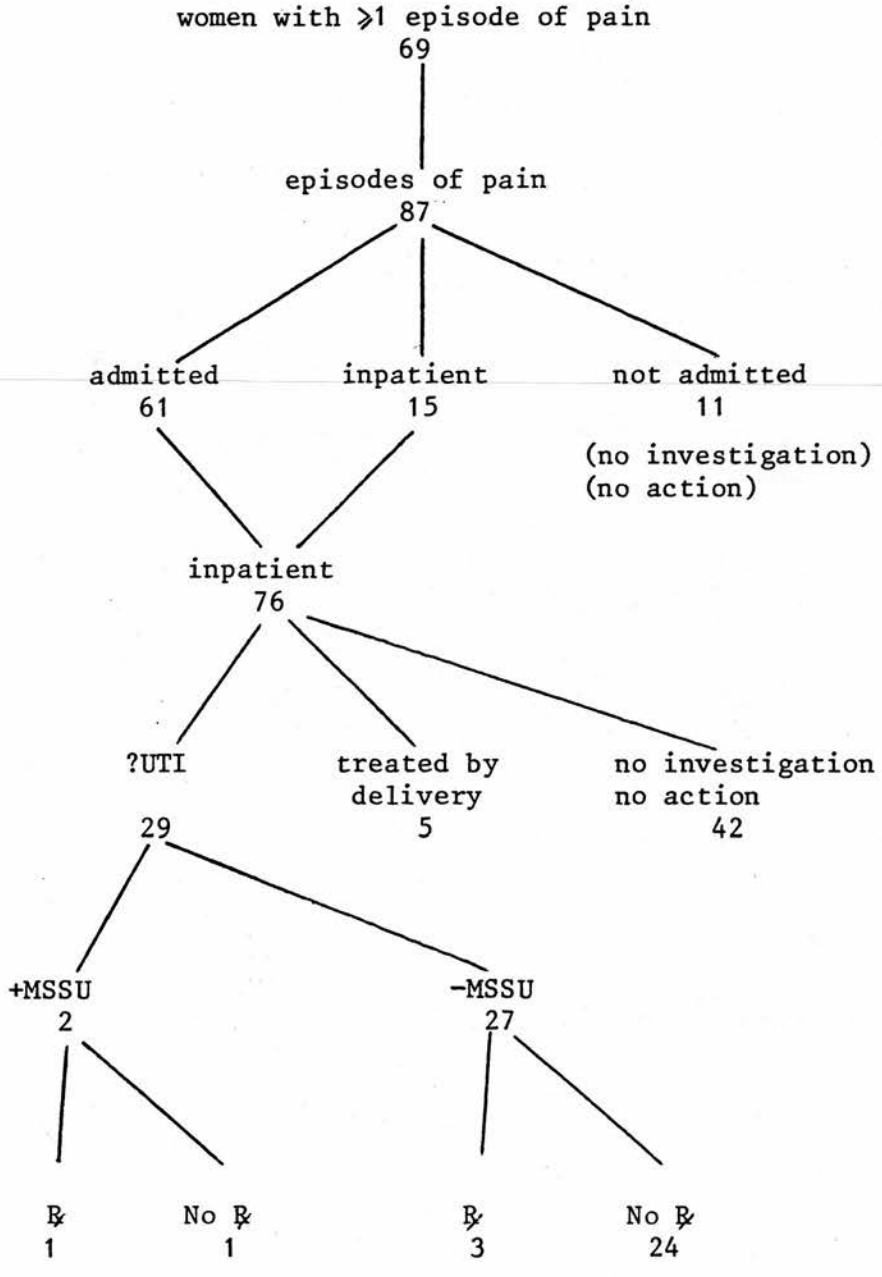


FIGURE VII/III : ABDOMINAL PAIN OF UNDETERMINED AETIOLOGY

(℞ = antibiotic treatment)

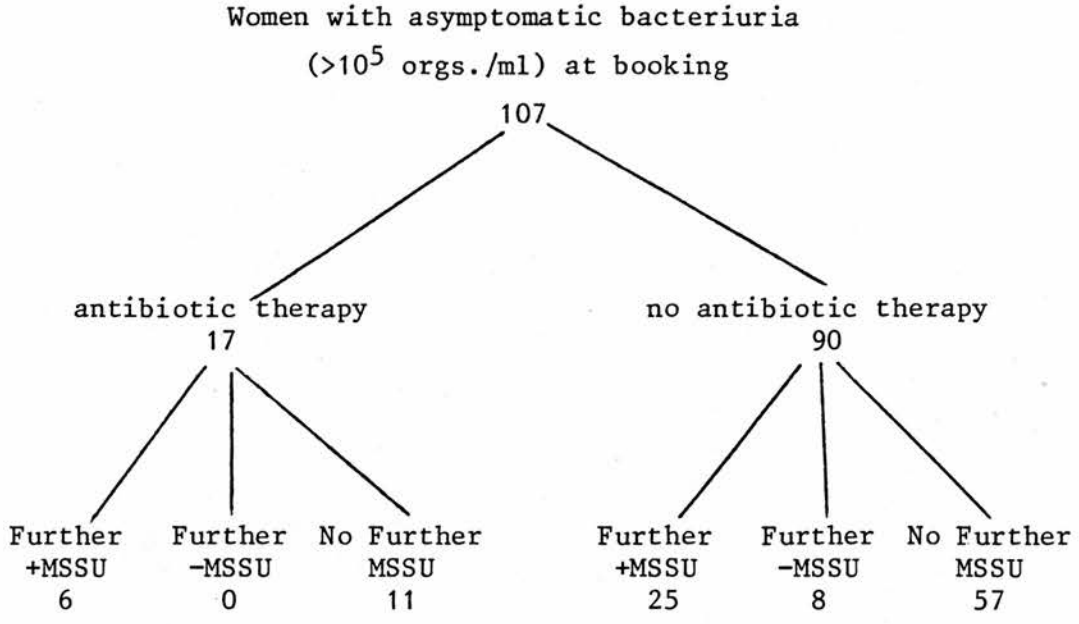


FIGURE VII/IV : ASYMPTOMATIC BACTERIURIA - TREATMENT AND OUTCOME

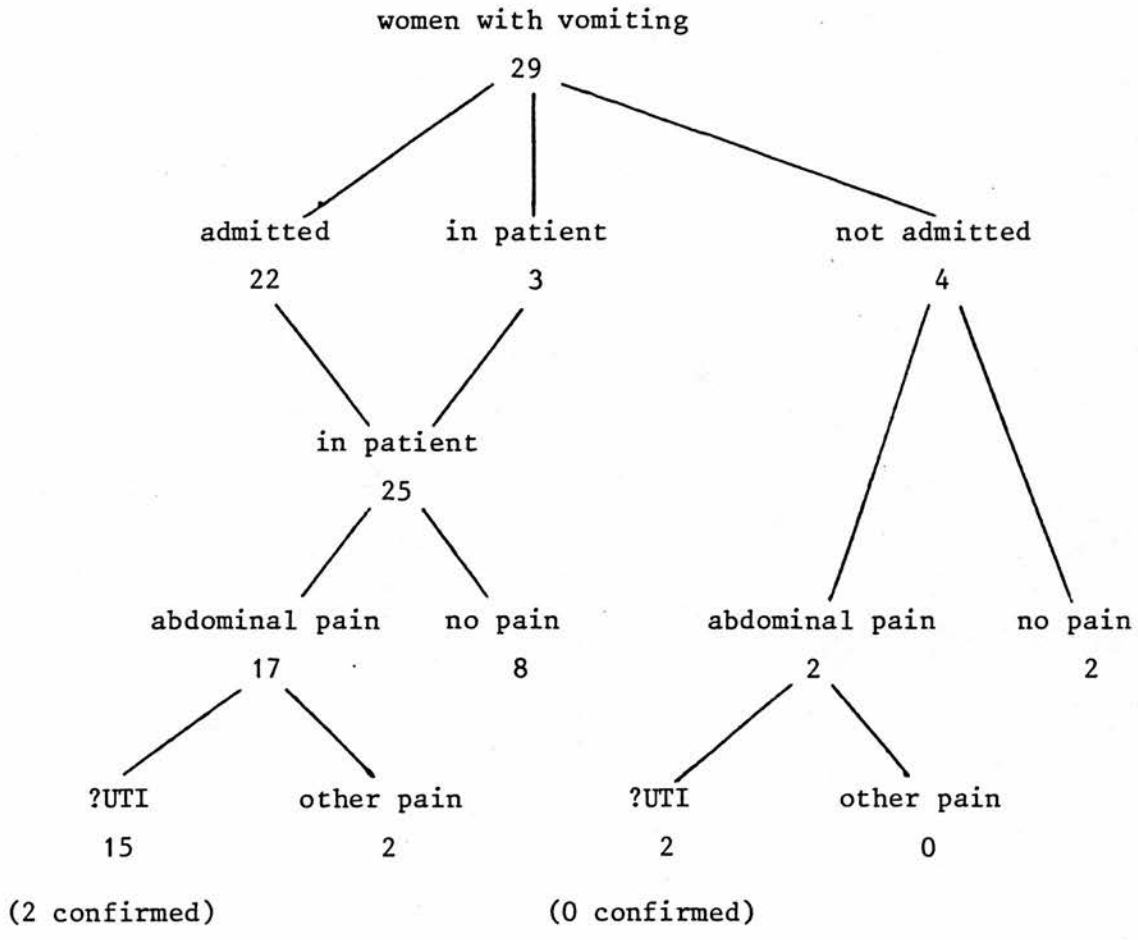


FIGURE VII/V : THE ASSOCIATION OF VOMITING WITH ABDOMINAL PAIN

CHAPTER VIII - MANAGEMENT OF SPECIFIC PROBLEMS : HYPERTENSION

Pre-eclampsia/eclampsia is still one of the most important causes of maternal death in obstetric practice. In pregnancies complicated by hypertensive disease not only is the mother at risk but there is also increased fetal mortality and morbidity due to pre-term delivery (usually elective), placental abruption, intrauterine growth retardation and birth asphyxia. Bad prognostic features include early gestation at onset, severe hypertension and evidence of a generalised disease process as indicated by the presence of albuminuria. Hypertension may be induced by the pregnancy, may be present before the onset of pregnancy, or may be a combination of the two with pre-eclampsia superimposed on pre-existing essential or chronic hypertension. Such chronic hypertension predisposes to the development of pre-eclampsia (Butler and Bonham, 1963) and the risk is also influenced by parity being much commoner in primigravidae (Macgillivray, 1958).

Diagnostic criteria are imprecise but are usually stated either in terms of rise above the pre-pregnancy level or in absolute levels of blood pressure. Other factors compound the problems of diagnosis; thus the blood pressure varies at different stages of pregnancy, at different times of the day, in relation to meals and activity and with differing positions, and the actual recording of blood pressure is subject to various errors and inaccuracies. Consequently, isolated recordings are of limited value. Traditionally, however, a blood pressure of $\geqslant$140/90 mmHg is regarded as abnormal and in this study a diastolic blood pressure of $\geqslant$90 mmHg was adopted as the definition of hypertension.

Such difficulties in diagnosis lead to problems in assessing incidence. If a diastolic blood pressure of 90 mmHg is taken as the threshold of abnormality a considerable proportion of the obstetric population will fall into this category, particularly if isolated recordings are used, and many of these women will not develop sustained hypertension.

In this study, hypertension was further categorised as mild, moderate or severe (diastolic blood pressure $\geq 90 \leq 95$ mmHg, $>95<110$ mmHg and ≥ 110 mmHg respectively). Separate codes were used to indicate the presence or absence of proteinuria at each level of hypertension; chronic hypertension was also coded as a separate entity with superimposed pre-eclampsia recorded appropriately.

In the study sample of 1302 women, there were no cases of eclampsia. Two hundred and sixty-two women (20.1%) with singleton pregnancies had a diastolic blood pressure of ≥ 90 mmHg recorded at least once during their pregnancy. Of these, 228 (87%, 17.5% of the whole group) became hypertensive during their pregnancies and 34 (13%, 2.6% of the whole group) had pre-existing hypertension. Of the 34 women in the latter category, eight developed superimposed pre-eclampsia. Of the 262 women, 101 (38.5%) were admitted antenatally on at least one occasion specifically because of hypertension and spent a total of 587 days as inpatients because of this complication (11.6% of the total inpatient days for the whole group). One hundred and thirty-three (50.8%) were primiparae and 129 (49.2%) were multiparae, the

proportions of primiparae in the admitted and non-admitted groups being very similar at 52.5% and 49.7% respectively. The presenting category of hypertension for all 262 women is shown in Table VIII/I while Table VIII/II shows the gestation at which hypertension was first noted excluding those women with chronic hypertension. Of the 34 women with chronic hypertension 32 attended hospital for booking before 20 weeks gestation and were noted to be hypertensive. The remaining 2 women booked at 21 weeks gestation with a known history of chronic hypertension and an elevated blood pressure at the booking visit. In the 8 cases where there was superimposed pre-eclampsia, the onset was at $\leq$30 weeks gestation in 2, 31-34 weeks in 1, 35-38 weeks in 4 and >38 weeks in 1 case. These 34 women are not included in the following discussion and the question of chronic hypertension will subsequently be considered separately.

Table VIII/III combines the information in Tables I and II to give the presenting category of hypertension by the gestation at which it was first noted. These three tables show that of the 228 women with pregnancy induced hypertension, the majority (75.9%) initially presented with mild non-proteinuric hypertension while the commonest time for a rise in blood pressure to manifest itself was at $\geq$35 weeks gestation (71.5%). In 22.4% of cases the problem was one of mild hypertension with onset at >38 weeks gestation.

Of these 228 women, 58 (24.5%) were admitted the first time a rise in blood pressure was noted. Table VIII/IV shows the rate

of admission for different gestations at presentation while Table VIII/V shows the admission rates for the different categories of hypertension. It is thus apparent that admission rates increased with increasing gestation at presentation and also with increasing severity of hypertension. Forty-three of those women not initially admitted were however admitted at a later gestation because of sustained hypertension.

When the first abnormal recording of blood pressure was noted some women had their blood pressure rechecked while still at the antenatal clinic but referral to the Day Care Area for assessment was more common; a considerable proportion, however, did not have their blood pressure rechecked and the abnormal reading was ignored or at least not acted upon. (One such woman, described in the case records as hypertensive, in fact had a diastolic blood pressure of <85 mmHg.) Table VIII/VI shows the proportions of women whose blood pressures were rechecked at different gestations of presentation while Table VIII/VII shows the numbers rechecked according to the level of hypertension. From these it would appear that whether or not the blood pressure was rechecked depended mainly on the severity of hypertension with mildly elevated levels most commonly being ignored. Nevertheless a number of women with moderately elevated recordings did not have these rechecked.

Some women, after the initial hypertensive recording, did not develop sustained hypertension and the blood pressure was never subsequently noted to be raised. The remaining women developed

sustained hypertension, sometimes at the level first detected and sometimes with increasing severity of hypertension, but in some cases the disease proved less severe than was suggested by initial blood pressure recordings. Tables VIII/VIII and VIII/IX show the distribution of cases with non-sustained hypertension according to gestation and severity of disease at presentation. Thus the non-sustained hypertension rate rose with increasing gestation at presentation and in 87.0% of cases presenting for the first time at >38 weeks gestation the blood pressure was never subsequently noted to be abnormal. The rate was higher where the hypertension was mild while an initial presentation with severe hypertension almost invariably proved to be significant leading to sustained hypertension; rather surprisingly there was still a substantial non-sustained rate when moderate hypertension presented. Table VIII/X shows the non-sustained rates according to whether the woman was admitted when hypertension was first noted. It is considered in this way rather than relative to the overall admission rate for hypertension since those women admitted later would have already proved to have sustained hypertension. Despite the observational facilities afforded by the Day Care Area, however, the incidence of cases with non-sustained hypertension is not significantly lower in the admitted group.

Having examined the general pattern for all levels of hypertension, the management of each of the categories will now be considered in more detail.

Mild Hypertension (D.B.P. >90<95 mmHg) No proteinuria

One hundred and seventy-three women initially presented with mild non-proteinuric hypertension of whom 28 were immediately admitted. Eleven were currently inpatients with other problems while 134 (77.5%) were not admitted at that time. A proportion of those admitted transpired to have non-sustained hypertension while some women not admitted subsequently developed sustained hypertension. Figure VIII/I shows the numbers with non-sustained hypertension in these three groups; there were thus in total 108 such women. Seventy-nine of these were never admitted while 11 were already inpatients. In these 90 women, no further attention was paid to the problem. Eighteen women with non-sustained hypertension were admitted for from one to seven days. Fifteen were ⩾38 weeks gestation, of whom seven were delivered because of this isolated recording of an elevated blood pressure while the other eight were not. These eight women together with the three at <38 weeks gestation were discharged undelivered. There was no apparent reason for the selection of cases for delivery at similar gestations to those not delivered.

Sixty-five women in this group developed sustained hypertension of whom ten were admitted when the blood pressure was first noted to be elevated. A further 25 were subsequently admitted. In some cases, the hypertension remained mild while in others it became more severe. Figure VIII/II shows the ultimate severity of hypertension in these women according to if and when they were admitted. Of the ten women initially admitted, two who were at ⩾38 weeks gestation were delivered within seven days. Two women

progressed to moderate hypertension with proteinuria and remained in hospital until delivery four and five weeks later. The remaining six women were discharged undelivered. In two of these hypertension remained mild and one was subsequently readmitted. The remaining four women progressed to moderate hypertension, of whom three were then readmitted.

Of the 55 women not initially admitted but subsequently proving to have sustained hypertension, 34 did not progress beyond a mildly elevated blood pressure. In 12 of these admission was considered merited at a later stage in pregnancy. Nineteen progressed to moderate hypertension but only 11 were admitted while the two women whose diastolic blood pressures ultimately reached $\geqslant$110 mmHg were both admitted. There was no apparent reason why admission should have been considered necessary for some women with mild hypertension while others with more severe disease were not admitted.

Mild Hypertension (D.B.P. $\geqslant$90$\leqslant$95 mmHg) With Proteinuria

As shown in Figure VIII/III, 12 women presented in this category; eight were admitted at that time, one was already an inpatient and three were not admitted. The eight women admitted spent from one to eight days in hospital; four of these proved to have neither sustained hypertension nor proteinuria but one woman at 39 weeks gestation was nevertheless delivered because of this. In the remaining cases without sustained hypertension or proteinuria no further attention was paid to the problem. Four women initially admitted proved to have sustained hypertension. In one this rapidly

became moderate hypertension with proteinuria and she was delivered less than 48 hours later. The other three, none of whom had proteinuria recorded subsequently, were all discharged undelivered; all progressed to moderate hypertension whereupon two were readmitted. The two women who were not initially admitted, but who proved to have sustained hypertension, were both admitted at a later stage in pregnancy with the same severity of disease.

Moderate Hypertension (D.B.P. >95<110 mmHg) No Proteinuria

Thirty-seven women presented in this category of whom 18 were initially admitted, five were already inpatients while 14 were not admitted. Fifteen women in this group were subsequently normotensive while 22 progressed to sustained hypertension. Figure VIII/IV shows the distribution of these in the three groups.

Of the total 15 women with non-sustained hypertension, six were initially admitted and spent from two to seventeen days as inpatients. Although all were consistently normotensive, three were electively delivered while three were discharged undelivered. At the time of discharge or delivery all were ⩾37 weeks gestation and there was no apparent reason for the selection of cases for delivery. One woman was already an inpatient; she was normotensive thereafter and the problem was subsequently disregarded. The remaining eight women with non-sustained hypertension were not admitted although one had elective delivery arranged for a few days later. There was no apparent reason for her to be delivered rather than the other seven at marginally more advanced gestations.

Of the 22 women who proved to have sustained hypertension, 12 were initially admitted. Seven did in fact prove to have moderate hypertension (Figure VIII/V); after spending from two to seven days as inpatients, six of these women (all at $\geq$37 weeks gestation) were delivered because of their hypertension. The seventh woman, at 33 weeks gestation, despite persistent moderate hypertension and a recorded suspicion of fetal growth retardation was not subsequently readmitted and went into spontaneous labour at term (the baby weighed less than the 10th centile for gestation). The remaining five admitted women with sustained hypertension all proved to have only mildly elevated blood pressures (Figure VIII/V); after spending from one to four weeks as inpatients two were electively delivered (one for a different indication), two went into spontaneous labour and one was discharged undelivered. In all cases there were no other apparent problems causing retention in hospital and again decisions regarding management appeared arbitrary.

Four women were already inpatients when they developed sustained hypertension in three of whom the blood pressure remained moderately elevated. In the fourth case it settled to the mild category and the problem was subsequently ignored. Of the other three, one went into spontaneous labour at term a few days later and one was electively delivered at 33 weeks gestation. The third woman who had been normotensive throughout an uncomplicated pregnancy was admitted at 36 weeks gestation with a severe placental abruption and intrauterine death. Following delivery she became hypertensive and remained so for some time.

In the six cases of sustained hypertension not initially admitted, all subsequently proved to have only mildly elevated blood pressures and none were admitted at any time because of this problem.

Moderate Hypertension (D.B.P. >95<110 mmHg) With Proteinuria

Only two women presented in this category, one at 39 and one at 35 weeks gestation. The former was admitted to hospital and on confirmation of the diagnosis was electively delivered. The latter was not admitted; although the proteinuria proved non-sustained she remained moderately hypertensive but was never admitted to hospital during her pregnancy.

Severe Hypertension (D.B.P. ≥110 mmHg) No Proteinuria

Four women presented in this category of whom only one did not prove to have sustained hypertension. This woman was admitted at term when first noted to have an elevated blood pressure; although subsequently normotensive she was electively delivered. Two women were admitted (one transferred from another hospital) and delivered by caesarean section at 30 and 33 weeks gestation because of fulminating pre-eclampsia with proteinuria. The third woman with sustained hypertension presented at 39 weeks gestation. Despite a diastolic blood pressure recorded at ≥110 mmHg she was not admitted to hospital. A week later when reviewed she was moderately hypertensive; she was then admitted and electively delivered.

Chronic Hypertension

Thirty-four women had a history of hypertension prior to the

pregnancy; interestingly, although all were indeed noted to be hypertensive at the booking visit, four women never had a raised blood pressure recorded during the remainder of the pregnancy. As has been noted, all 34 women attended for booking at ⩽21 weeks gestation. In total, 15 women were admitted antenatally because of their hypertension, five initially and ten at a later stage and spent from three to twenty-eight days as inpatients. One of the women initially admitted was also one of the four women normotensive throughout the remainder of the pregnancy.

Eight women were subsequently considered to have developed superimposed pre-eclampsia, three of whom were in the admitted group. All three were admitted when their hypertension became more severe but only one had been previously admitted because of her chronic hypertension. Figure VIII/VI summarises the admissions and subsequent pre-eclampsia in the group. In six women, however, the additional rise in blood pressure proved insignificant and they remained in the mild category; five were never admitted while one spent two weeks as an inpatient until spontaneous labour occurred at term. In the other two women hypertension became moderate. One woman at 39 weeks gestation was admitted for a week then delivered by elective caesarean already planned on other grounds; the other woman was transferred at 29 weeks gestation from another hospital with moderate hypertension and proteinuria and was immediately delivered by caesarean section.

Onset of Labour and Mode of Delivery

In the study group as a whole 354 women (27.2%) had their labours induced, 914 (70.2%) had a spontaneous vaginal delivery, 186 (14.3%) had a forceps delivery and 188 (14.4%) were delivered by caesarean section. Tables VIII/XI and VIII/XII show the comparable rates for the hypertensive group as a whole and also for the admitted and non-admitted components. Thus while the induction rate is rather higher and the incidence of spontaneous labour rather lower in the hypertensive group, these differences are most marked in the admitted group while those not admitted differ only minimally from the group as a whole. Similarly, while the forceps delivery and caesarean section rates are higher in the hypertensive group than in the whole study group, this is largely due to the increased rates in the admitted group.

Pregnancy Outcome

There were no neonatal deaths and only one stillbirth in the group of 262 hypertensive women. This was the death due to placental abruption; this woman however was never manifestly hypertensive until after the abruption and fetal death occurred.

In the total study group, 129 babies (9.9%) had weights <10th centile for gestation using the Aberdeen growth charts (Thomson et al, 1968). While such small numbers are of limited significance, the number of growth retarded babies in the hypertensive group as a whole was 23 (8.8%) of whom three were to women with chronic hypertension (none of whom had superimposed pre-eclampsia). Of the 20 such babies in the pregnancy induced

hypertension group, only seven occurred in the group of 98 women with sustained hypertension.

In the total study group, 83 babies (6.4%) were delivered at <37 weeks gestation; while again the numbers are too small to be significant, it is interesting to note that the equivalent number for the 262 in the hypertensive group is ten. Six of these ten babies were electively delivered because of maternal hypertension.

Parity

In the whole study group there were 575 primiparae (44.2%). In the whole hypertensive group as has been noted, there were 133 (50.8%) primiparae with similar proportions in the admitted and non-admitted groups (52.5% and 49.7% respectively). Parity is considered to influence the incidence of pregnancy induced hypertension; nevertheless, if only these are considered with chronic hypertensives excluded, the proportion of primiparae is still very similar (119, 52.5%). One could argue that this influence is only relevant in cases of sustained hypertension; while the numbers are small and therefore of limited significance, it is interesting to note that of the 98 women with sustained hypertension the proportion of primiparae is exactly the same (51, 52.0%). These proportions are shown in Table VIII/XIII.

Source of Referral

The 101 women in the whole hypertensive group who were admitted antenatally had a total of 114 admissions. Eleven women were admitted twice because of hypertension while

one woman was admitted on three occasions. As would be expected, the majority of these admissions (98) were consequent on an attendance at the antenatal clinic. Fourteen admissions resulted from general practitioner referral while two women were transferred from other hospitals because of hypertension necessitating delivery of very preterm infants.

Discussion

Since hypertension was one of the commonest causes of admission in this study and was responsible for 11.6% of the total number of inpatient days, it is therefore necessary to consider the possible objectives of such management. Initial claims for the benefit of bed rest in pre-eclampsia were based on improvements in outcome noted when admission was introduced in an uncontrolled way (Hamlin, 1952). A randomised controlled trial of bed rest in mild late onset hypertension failed to show any benefit with no difference in pregnancy outcome with bed rest or normal activity (Matthews, 1977). Indirect support for this also comes from a placebo controlled trial of antihypertensive therapy in pregnancy; while the treatment group were normally active outpatients, spontaneous preterm labour and respiratory distress syndrome were limited to the placebo group who were mainly confined to hospital (Rubin, 1983). A small controlled trial of bed rest in severe proteinuric pre-eclampsia showed no effect on renal function (Matthews et al, 1980); although there was some evidence that bed rest in such women improved fetal outcome (Matthews, 1982) bed rest as a therapeutic measure does not justify antenatal admission.

An alternative approach to treatment is the use of drugs. Sedatives have been used for many years but have no proven benefit (Matthews, 1977). Methyldopa when used from early pregnancy in women with essential hypertension or pre-eclampsia was reported to lower the incidence of fetal loss by midtrimester abortion (Redman et al, 1976) with no longterm adverse effects on the fetus (Oumsted et al, 1983). β adrenergic receptor blocking agents have been shown to be safe and effective in the treatment of hypertension in pregnancy (Gallery et al, 1979; Rubin et al, 1983). While the use of such antihypertensives appears to reduce blood pressure in pregnancy without adversely affecting the fetus, there is not yet good evidence of improved fetal outcome in mild or moderate pre-eclampsia; clearly, however, severe pre-eclampsia should be treated with antihypertensives in the maternal interests.

There is some controversy regarding the effects on the fetus of hypertension in pregnancy. Although one large collaborative study showed an increased fetal risk with even minimal rises in blood pressure at any gestation (Friedman and Neff, 1977) these findings have not been confirmed by other reports. Some suggest it is the gestation of onset which is important with any degree of elevation in the first or second trimesters resulting in increased fetal loss (Silverstone et al, 1980; Page and Christianson, 1976a; MacGillivray, 1961). Others suggest it is the severity which is the critical factor and the British Births Survey in 1970 showed no increase in perinatal mortality with even moderate hypertension in the absence of proteinuria (Chamberlain et al, 1978). Severe pre-eclampsia is quoted as a major cause of growth

retardation (Gruenwald, 1966, 1969; Butler and Alberman, 1969) although again gestation is said to be important with late onset hypertension having less effect in this respect (Baird et al, 1957; Hendricks and Brenner, 1971; Long et al 1980). Conversely, it is reported that mild or moderate pre-eclampsia at any gestation does not impair fetal growth (Baird et al, 1957; Low and Galbraith, 1974) while some claim there is no relationship between fetal growth retardation and pre-eclampsia (Brash, 1949; Beaudry and Sutherland, 1960; De Souza et al, 1976). There is, however, general agreement that severe disease of early onset is associated with increased risks to the fetus in terms of perinatal mortality, intrauterine growth retardation and neonatal morbidity (Benedetti et al, 1982; Browzy et al, 1982; Moore and Redman, 1983; Sibai et al, 1984; Butler and Alberman, 1969, Lopez-Llera et al, 1972) while mild hypertension of late onset has no adverse effects on the fetus (Baird et al, 1957; Butler and Bonham, 1963; Butler and Alberman, 1969; Hendricks and Brenner, 1971; Low and Galbraith, 1974; Page and Christianson, 1976b; Chamberlain et al, 1978; Long et al, 1980).

In the light of these facts concerning treatment and fetal risk from hypertension and given that bed rest in itself has no therapeutic value, the aim must be to admit those with, or at risk of, severe or progressive disease, partly for supervised treatment of the mother but mainly for monitoring of the fetus to allow optimum timing of delivery.

This study confirms that the two main indicators of risk

are the presenting level of hypertension and the gestation at which it develops; the higher rates of non-sustained hypertension with mildly elevated levels and late gestation of onset have already been reported (Redman, 1982; Hall and Chng, 1982) and are also demonstrated by this study. The rising risk with increasing severity of hypertension is generally reflected in admission trends seen here; nevertheless, many women with low risk mild hypertension were admitted. Presumably the fear was of progressive disease, although women who ultimately developed severe hypertension usually presented with higher initial levels. More women with moderate hypertension were admitted but a significant proportion were not and selection often appeared arbitrary. The highest admission rate was in women with severe hypertension but surprisingly was not universal even where levels were clearly abnormal. Higher levels of hypertension would also appear to have generated more alarm in that they were rechecked more often. It is interesting to note, however, that while isolated blood pressure recordings are of limited value and repeated measurements are necessary to accurately detect abnormality, the converse is also true. If the blood pressure is checked often enough the occasional high recording is likely; where abnormal levels were noted with frequent recordings during antenatal admissions for other reasons, these proved significant in only a few cases.

With gestation of onset, however, expected and observed practice agree less well. Indeed, there is an inverse relationship between admission rates and the likelihood of genuine

disease at any given gestation. While the numbers presenting with hypertension increased with increasing gestation the rate of non-sustained hypertension correspondingly increased. Thus fewer women presented at early gestations but the prognostic significance was greater. Nevertheless, admission rates were lowest at earlier gestations and rose with increasing gestation as the prognostic significance declined. Not only is the rate of non-sustained hypertension higher at later gestations but, as has been noted, where hypertension is sustained, except in severe disease, the risks to the fetus are less. At this gestation, however, the fetus is mature and intervention to expedite delivery must seem an attractive solution to the problem. Thus many women with late onset mild hypertension, both sustained and non-sustained, were delivered; presumably awareness of the lack of substantial risk led to the apparently arbitrary selection of cases for delivery.

Although the well documented increased incidence of pre-eclampsia in primiparae is not demonstrated the results of this study agree with other published work. There were too few women with severe hypertension to demonstrate any adverse effects on the fetus; while the numbers are still too small to be significant, for those women with mild or moderate pre-eclampsia or uncomplicated essential hypertension this study confirms the lack of risk to the fetus either in terms of mortality or parameters of morbidity such as preterm delivery or intrauterine growth retardation.

This study highlights several problems regarding management of hypertension in pregnancy. Firstly, there is the problem of the high rate of isolated recordings of elevated blood pressure. In the 1958 Perinatal Mortality Survey and the 1970 British Births Survey (Butler and Bonham, 1963; Chamberlain et al, 1978) some form of hypertension occurred in 26.1% and 27.5% of pregnancies respectively. In this study 20.1% of women had a blood pressure above the "diagnostic" level recorded at least once during their pregnancy but of those so identified as potentially at risk less than half actually developed sustained hypertension. The diastolic blood pressure of $\geqslant$90 mmHg taken as the definition of hypertension in this study has practical relevance being the criterion used in the hospital's policy for referral to the Day Care Area. It might be expected that the observational facilities afforded by the Day Care Area together with firm guidelines for referral would lead to more accurate diagnosis with admission of a higher proportion of cases with sustained hypertension. This was not the case and for every correctly identified case admitted there was one woman admitted who did not develop sustained hypertension. This poor pick up rate could only partly be explained by incomplete referral to the Day Care Area.

A further problem is the identification of those women with sustained hypertension who will progress to severe or fulminating pre-eclampsia and pose serious clinical problems. Unfortunately, such women often present without a warning history of milder disease and often the blood pressure does not rise until

after eclampsia or abruption has occurred. Thus, in this study, even for women with sustained hypertension there was no apparent consensus on management; such inconsistencies in observed practice must reflect clinical awareness of the diagnostic and prognostic difficulties.

While the value of frequent blood pressure estimations from an early gestation has been questioned (Hall, 1980) the low productivity of such screening has been justified by others by the serious nature of the potential risks (Redman, 1982). Eclampsia is now extremely rare and the main concern with hypertensive disease is that it might progress to the stage where the fetus is at risk. Low productivity is not the only disadvantage of such screening; of concern must also be the poor specificity and the increased intervention in women with non-sustained or mild disease. Moreover, the most serious problems may not be identified by such screening programmes as evidenced by the single fetal death in this study. A more rational approach to management is required; the introduction of the Day Care Area was viewed as a means of avoiding unnecessary admissions and interventions while an alternative approach is the use of Community Midwives to carry out observation and monitoring in the woman's own home (Feeney, 1984). Such methods will not solve the diagnostic problems of identifying those women who will develop major problems; if used properly however, they may at least be of some benefit to those not at risk and be more acceptable to the women concerned.

	D.B.P. ⩾90⩽95 mmHg		D.B.P. >95<110 mmHg		D.B.P. ⩾110 mmHg		Chronic hypertension	Total
	No	p	No	p	No	p		
No. of women	173 *66.0%*	12 *4.6%*	37 *14.1%*	2	4	0	34 *13.0%*	262 *100%*

TABLE VIII/I: PRESENTING CATEGORY OF HYPERTENSION

(D.B.P. = Diastolic Blood Pressure; p = proteinuria)

	⩽30 weeks	31–34 weeks	35–38 weeks	>38 weeks	Total
No. of women	33 *14.5%*	32 *14.0%*	94 *41.2%*	69 *30.3%*	228 *100%*

TABLE VIII/II: GESTATION AT PRESENTATION OF HYPERTENSION

	D.B.P. ⩾90⩽95 mmHg		D.B.P. >95<110 mmHg		D.B.P. ⩾110 mmHg	Total
	No p	p	No p	p	No p	
⩽30 weeks	28 *84.8** *16.2+*	2	2 *6.1* *5.4*	0	1	33 *14.5*
31-34 weeks	26 *81.3* *15.0*	1	4 *12.5* *10.8*	0	1	32 *14.0*
35-38 weeks	68 *72.3* *39.3*	7	18 *19.2* *48.7*	1	0	94 *41.2*
>38 weeks	51 *73.9* *29.5*	2	13 *18.8* *35.1*	1	2	69 *30.3*
Total	173 *75.9*	12 *5.3*	37 *16.2*	2	4	228 *100*

TABLE VIII/III : CATEGORY OF HYPERTENSION BY GESTATION AT PRESENTATION

(D.B.P. = Diastolic Blood Pressure; p = proteinuria)

* Row percentage

+ Column percentage

	<30 weeks	31–34 wks	35–38 wks	>38 weeks	Total
Not admitted	28 *18.3** *84.8+*	24 *15.7* *75.0*	61 *39.9* *64.9*	40 *26.1* *58.0*	153 *67.1*
Admitted	5 *8.6* *15.2*	7 *12.1* *21.9*	24 *41.4* *25.5*	22 *37.9* *31.9*	58 *25.4*
In patient	0	1	9	7	17 *7.5*
Total	33 *14.5*	32 *14.0*	94 *41.2*	69 *30.3*	228 *100*

TABLE VIII/IV : ADMISSION RATES BY GESTATION AT PRESENTATION#

	D.B.P. ⩾90⩽95 mmHg		D.B.P. >95<110 mmHg		D.B.P. ⩾110 mmHg	Total
	No p	p	No p	p	No p	
Not admitted	134 *87.6** *77.5+*	3	14 *9.2* *37.8*	1	1	153 *67.1*
Admitted	28 *48.3* *16.2*	8	18 *31.0* *48.7*	1	3	58 *25.4*
In patient	11 *64.7* *6.4*	1	5 *29.4* *13.5*	0	0	17 *7.5*
Total	173 *75.9*	12 *5.3*	37 *16.2*	2	4	228 *100*

TABLE VIII/V : ADMISSION RATES BY PRESENTING CATEGORY OF HYPERTENSION#

(* Row percentage. + Column percentage)

(# N.B. admission rates refer to admission when abnormality first noted and not total admission rates for hypertension)

	≤30 weeks	31-34 wks	35-38 wks	>38 weeks	Total
Not rechecked	# 19	15	35	38	107
	*17.8**	*14.0*	*32.7*	*35.5*	*46.9*
	57.6+	*46.9*	*37.2*	*55.1*	
Rechecked	14	17	59	31	121
	11.6	*14.0*	*48.8*	*25.6*	*53.1*
	42.4	*53.1*	*62.8*	*44.9*	
Total	33	32	94	69	228
	14.5	*14.0*	*41.0*	*30.3*	*100*

TABLE VIII/VI : RECHECKING OF BLOOD PRESSURE BY GESTATION OF PRESENTATION

	D.B.P. ≥90≤95 mmHg		D.B.P. >95<110 mmHg		D.B.P. ≥110 mmHg	Total
	No	p	No	p	No	
Not rechecked	#99	2	6	0	0	107
	*92.5**		*5.6*			*46.9*
	57.2+		*16.2*			
Rechecked	74	10	31	2	4	121
	61.2		*25.6*			*53.1*
	42.8		*83.8*			
Total	173	12	37	2	4	228
	75.9	*5.3*	*16.2*			*100*

TABLE VIII/VII : RECHECKING OF BLOOD PRESSURE BY SEVERITY OF HYPERTENSION

* Row percentage

\+ Column percentage (# - 1 woman with diastolic BP ≤85 mmHg)

	⩽30 weeks	31-34 wks	35-38 wks	>38 weeks	Total
Sustained hypertension	25 *25.5** *75.8+*	18 *18.4* *56.3*	46 *46.9* *48.9*	9 *9.2* *13.0*	98 *43.0*
Non-sustained hypertension	8 *6.2* *24.2*	14 *10.8* *43.8*	48 *36.9* *51.1*	60 *46.2* *87.0*	130 *57.0*
Total	33 *14.5*	32 *14.0*	94 *41.2*	69 *30.3*	228 *100*

TABLE VIII/VIII : NON-SUSTAINED HYPERTENSION RATE BY GESTATION AT PRESENTATION

	D.B.P. ⩾90⩽95 mmHg		D.B.P. >95<110 mmHg		D.B.P. ⩾110 mmHg	Total
	No	p	No	p	No	
Sustained hypertension	65 *66.3** *37.6+*	6	22 *22.5* *59.5*	2	3	98 *43.0*
Non-sustained hypertension	108 *83.1* *62.4*	6	15 *11.5* *40.5*	0	1	130 *57.0*
Total	173 *75.9*	12 *5.3*	37 *16.2*	2	4	228 *100*

TABLE VIII/IX : NON-SUSTAINED HYPERTENSION BY PRESENTING SEVERITY OF HYPERTENSION

	Admitted	Not admitted	In patient	Total
Sustained hypertension	29 *29.6** *50.0+*	65 *66.3* *42.5*	4 *4.1* *23.5*	98 *43.0*
Non-sustained hypertension	29 *22.3* *50.0*	88 *67.7* *57.5*	13 *10.0* *76.5*	130 *57.0*
Total	58 *25.4*	153 *67.1*	17 *7.5*	228 *100*

TABLE VIII/X : NON-SUSTAINED HYPERTENSION RATE BY ADMISSION WITH INITIAL HYPERTENSION

* Row percentage

\+ Column percentage

	Total group	Total hypertensive group	H.T. group N/admitted	H.T. group admitted
Spontaneous labour	858 *65.9%*	123 *46.9%*	93 *57.8%*	30 *29.7%*
Induction of labour	354 *27.2%*	116 *44.3%*	57 *35.4%*	59 *58.4%*
C. section not in labour	90 *6.9%*	23 *8.8%*	11 *6.8%*	12 *11.9%*
Total	1302 *100.0%*	262 *100.0%*	161 *100.0%*	101 *100.0%*

TABLE VIII/XI : MODE OF ONSET OF LABOUR IN TOTAL AND HYPERTENSIVE GROUPS

	Total group	Total hypertensive group	H.T. group N/admitted	H.T. group admitted
Spontaneous vaginal delivery	914 *70.2%*	157 *59.9%*	107 *66.5%*	50 *49.5%*
Forceps delivery	186 *14.3%*	54 *20.6%*	25 *15.5%*	29 *28.7%*
Caesarean section	188 *14.4%*	48 *18.3%*	27 *16.8%*	21 *20.8%*
Vaginal breech	14 *1.1%*	3	2	1
Total	1302 *100.0%*	262 *100.0%*	161 *100.0%*	101 *100.0%*

TABLE VIII/XII : MODE OF DELIVERY IN TOTAL AND HYPERTENSIVE GROUPS

	Total study group	Total hypertensive group	Pregnancy induced hypertension	Sustained hypertension
Primiparae	575 *44.2%*	133 *50.8%*	119 *52.2%*	51 *52.0%*
Multiparae	727 *55.8%*	129 *49.2%*	109 *47.8%*	47 *48.0%*
Total	1302 *100.0%*	262 *100.0%*	228 *100.0%*	98 *100.0%*

TABLE VIII/XIII : PROPORTION OF PRIMIPARAE IN THE VARIOUS GROUPS

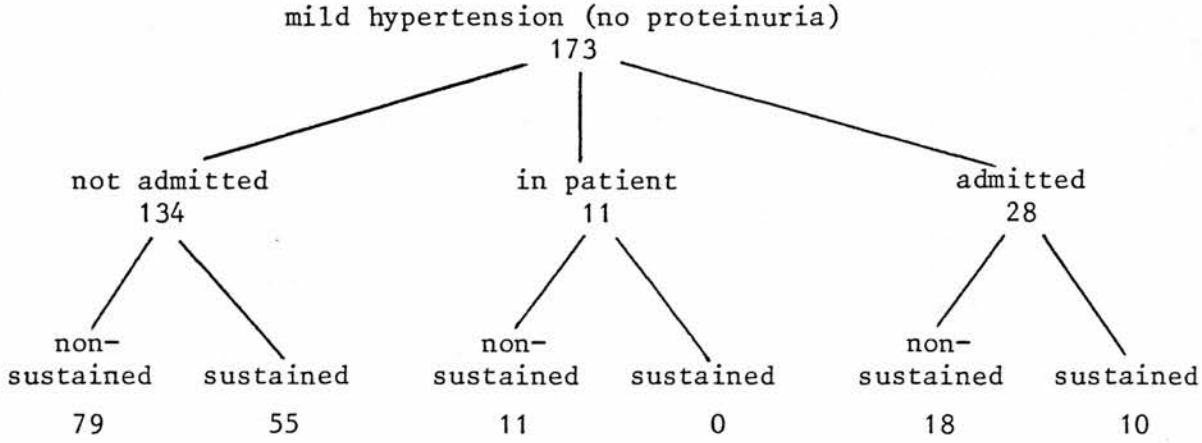


FIGURE VIII/I : NON-SUSTAINED HYPERTENSION BY INITIAL ADMISSION - MILD NON-PROTEINURIC HYPERTENSION

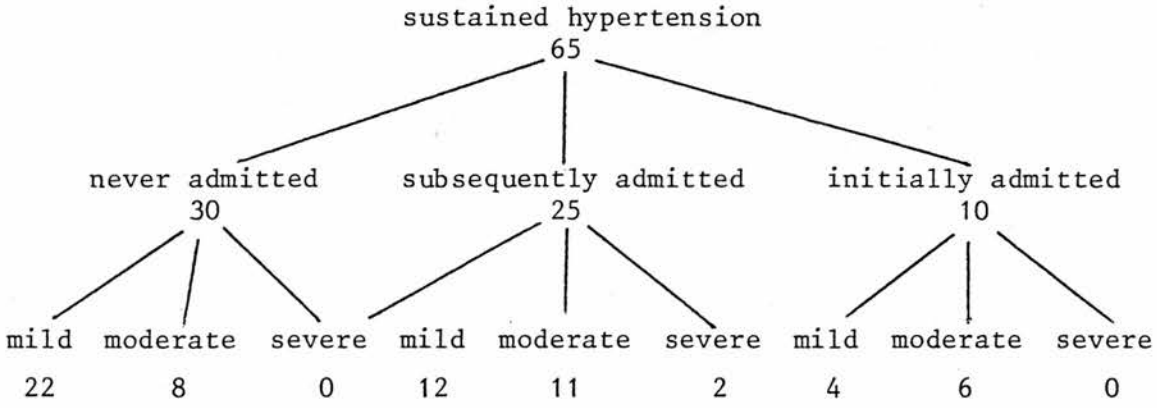


FIGURE VIII/II : MILD NON-PROTEINURIC HYPERTENSION - ULTIMATE SEVERITY OF SUSTAINED HYPERTENSION BY TOTAL ADMISSION

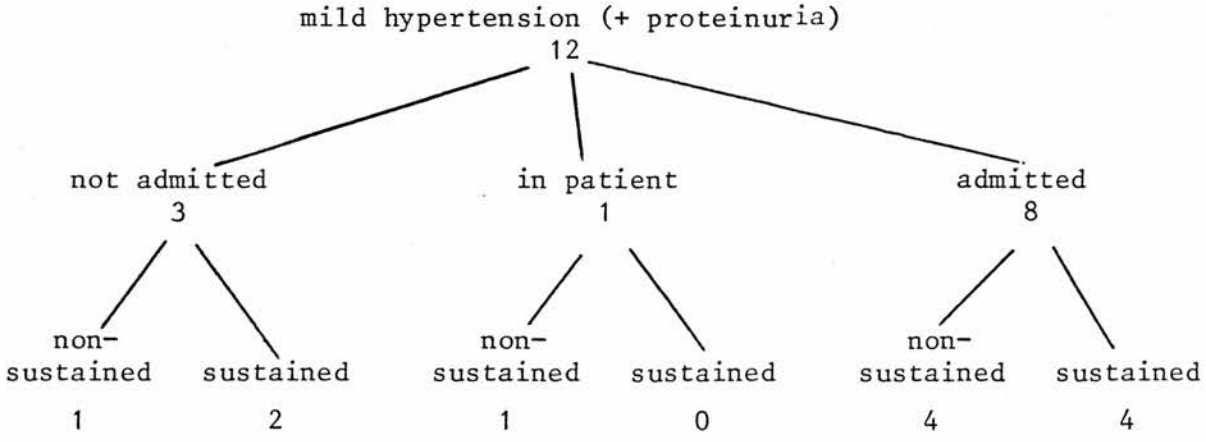


FIGURE VIII/III : MILD HYPERTENSION WITH PROTEINURA - NON-SUSTAINED HYPERTENSION RATE BY INITIAL ADMISSION

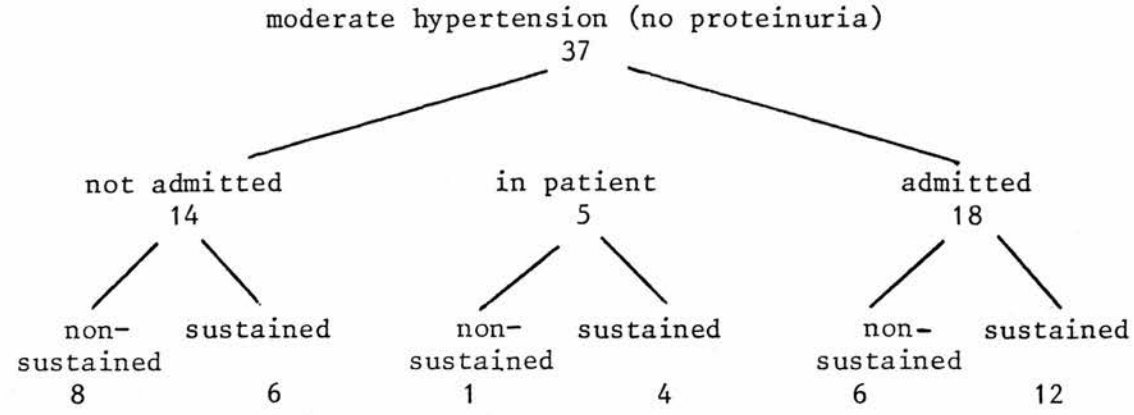


FIGURE VIII/IV : MODERATE HYPERTENSION - NO PROTEINURIA
NON-SUSTAINED HYPERTENSION RATE BY INITIAL ADMISSION

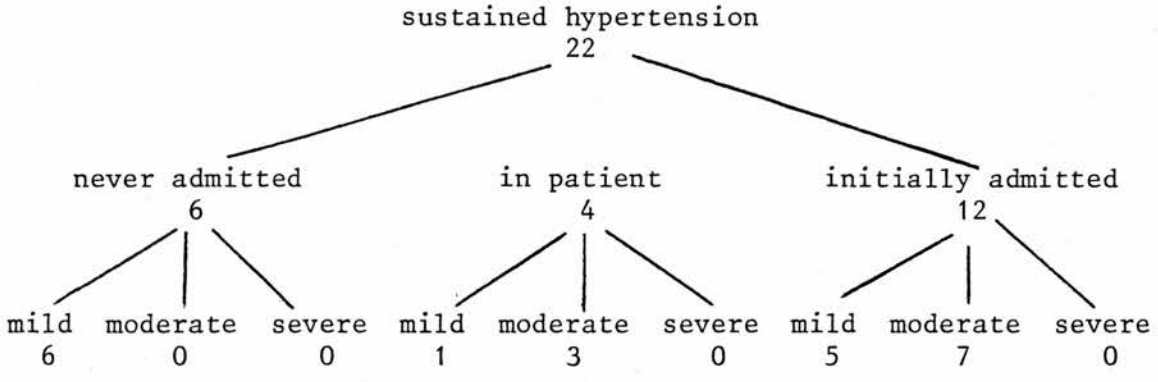


FIGURE VIII/V : MODERATE HYPERTENSION - NO PROTEINURIA
ULTIMATE SEVERITY OF SUSTAINED HYPERTENSION BY TOTAL ADMISSION

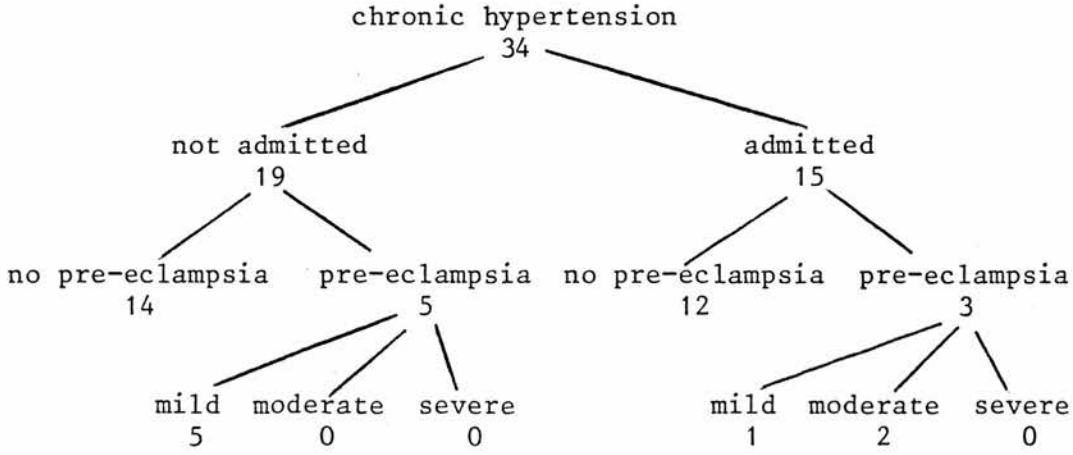


FIGURE VIII/VI : CHRONIC HYPERTENSION - INCIDENCE AND SEVERITY OF SUPERIMPOSED PRE-ECLAMPSIA BY ADMISSION

CHAPTER IX - MANAGEMENT OF SPECIFIC PROBLEMS : BLEEDING IN PREGNANCY

Despite the facilities available in specialist maternity units, haemorrhage remains one of the commonest causes of maternal mortality. Bleeding from the genital tract can occur at different stages in pregnancy with different aetiologies; nevertheless bleeding at any gestation has been shown to be associated with increased rates of fetal loss (Butler and Bonham, 1963; Chamberlain et al, 1978). The fetal loss associated with bleeding in pregnancy in this study, however, cannot be equated with that in the total population of pregnant women since only those women with pregnancies continuing to ⩾24 weeks gestation were included in the study group. Those women in whom bleeding resulted in earlier spontaneous abortion were thus excluded.

Vaginal bleeding during pregnancy was one of the most commonly occurring groups of complications and an important cause of hospital admission in this study. One hundred and sixty-five (12.7%) women in the study group with singleton pregnancies reported bleeding on at least one occasion during their pregnancies; six women with singleton pregnancies developed abdominal pain without bleeding thought to be due to placental abruption while a further four had a low lying placenta demonstrated on ultrasound but had no bleeding antenatally. Thus a total of 175 women (13.4% of the study group) either had bleeding or were diagnosed as having a condition with bleeding potential. Of these 175 women, 101 (57.7%) were admitted antenatally to the maternity hospital at least once specifically because of this complication; in addition, 21 women had at least one admission to the gynaecological

wards and a number of women experienced bleeding while already inpatients because of other complications. The total number of inpatient days in the maternity hospital contributed by admissions initiated by bleeding was 642 days (12.7 % of the total days in hospital for the whole group). The majority of admissions for bleeding resulted from self-referral; in seven cases admission was via the antenatal clinic while two women were referred by their general practitioner.

Both bleeding before and after 24 weeks gestation were among the most commonly occurring diagnostic categories already discussed. This problem was therefore of numerical significance throughout the entire period of gestation. Bleeding occurring before 24 completed weeks gestation was recorded as "threatened abortion"; where an abnormally sited placenta was demonstrated ultrasonically at this gestation this was additionally recorded by the appropriate code. Where bleeding occurred later in pregnancy a clinical impression of placental abruption or an ultrasonic diagnosis of placenta praevia was sometimes recorded in the case notes; bleeding with no clinical or ultrasound evidence to support either of these diagnoses was termed "bleeding of undetermined aetiology". Subsequent observation or investigation led on occasion to the diagnosis being revised and this was then recorded by the appropriate additional code; thus some movement occurred between the different categories. The gestation of 24 weeks rather than 28 weeks was taken as the cut off point for threatened abortion since the former is more satisfactory from an aetiological point of

view; thus placenta praevia may present with bleeding before 28 weeks and bleeding at these earlier gestations may be clinically suggestive of placental abruption.

The proportions of women with bleeding before and after 24 weeks are very similar being 43.4% and 41.7% respectively, while 9.1% of women had bleeding both before and after 24 weeks gestation (Table IX/I). The six women who presented with abdominal pain thought to be due to placental abruption but with no vaginal bleeding all presented at ⩾24 weeks and will be considered together with those women who actually bled at this gestation. Four women had placenta praevia diagnosed on ultrasound but no bleeding throughout pregnancy; two presented at ⩾24 weeks and again will be considered with those women who had bleeding. The remaining two women had the diagnosis made at <24 weeks while one other woman also had a low-lying placenta on ultrasound without bleeding at this stage but bled later in pregnancy. Since such early ultrasound diagnoses of placenta praevia in the absence of bleeding would not necessarily influence management at that time but would merely indicate the need for a further scan in later pregnancy to confirm the diagnosis, these three women are not included in the figures for bleeding at <24 weeks gestation; the one of these three women who bled later in pregnancy is, however, included for discussion in the appropriate group. The question of a low-lying placenta on ultrasound will also subsequently be considered separately.

A. Bleeding at <24 weeks gestation

Ninety-two women presented with bleeding at less than 24 completed weeks gestation of whom five had a low-lying placenta on ultrasound; a further three women had this diagnosis made in the absence of bleeding although, as has been noted, one of these women subsequently bled at a later gestation. When bleeding first occurred, 49 were admitted (28 to the Maternity Hospital), three were already inpatients and 40 were not admitted (Figure IX/I). Forty-four of these women (47.8%) were primiparae, the proportions of primiparae in the admitted and non-admitted groups being 53.1% and 42.5% respectively. Thirty-six women (39.1%) had a history of one or more previous abortions compared to 16.1% of the whole study group; the proportions of the admitted and non-admitted groups with such a history were 42.9% and 37.5% respectively. Two women with bleeding at <24 weeks gestation had had a previous perinatal death in addition to one or more previous abortions; both were admitted because of their bleeding.

Bleeding in the first trimester differs from that occurring in the second trimester both in aetiology and problems of management; therefore, women presenting at ⩽14 weeks gestation and those presenting at >14<24 weeks gestation will be considered separately. Fourteen weeks is taken as the dividing line again because it is aetiologically satisfactory but also because this is the cut off point used in hospital policy to determine whether admission is to the gynaecological or obstetric wards.

Of the 92 women with bleeding at <24 weeks gestation, 74 presented at ⩽14 weeks gestation, of whom 11 also had bleeding after 14 weeks gestation while 18 reported bleeding for the first time at >14 weeks. The admission rate was higher for bleeding at the greater gestation as shown in Figures IX/II and IX/III. In all cases these admissions resulted from self-referral and, conversely, virtually all cases of self-referral resulted in admission; thus in the majority of cases where admission did not occur this was because the bleeding was apparently not reported until some time later.

Six women had two episodes of bleeding at ⩽14 weeks while, as noted, 11 women bled both before and after 14 weeks gestation. There was no apparent consistency in admissions for recurrent bleeding with some women admitted on only one or other occasion, some on both and some on neither occasion. While abdominal pain accompanying the bleeding invariably prompted admission, this was not recorded as a feature in any of the cases of recurrent bleeding and it was not apparent from the case records why for some women similarly described episodes of painless bleeding generated different degrees of alarm. None of the three women with a low-lying placenta but no bleeding was admitted to hospital because of this diagnosis.

B. Bleeding at ⩾24 weeks gestation

Eighty-nine women developed bleeding at ⩾24 weeks gestation of

whom 16 had already bled earlier and two had previously had a low-lying placenta diagnosed on ultrasound in the absence of bleeding, one before and one after 24 weeks gestation. A further two women had this diagnosis made for the first time after 24 weeks gestation but did not bleed at any stage of pregnancy while six women who did not bleed were thought to have had a placental abruption. Of the 97 women with bleeding or conditions with bleeding potential after 24 weeks gestation, 73 (75.3%) were admitted, 16 were not, while eight were already inpatients when bleeding occurred (Figure IX/IV). Of the 16 women who had previously had bleeding at <24 weeks gestation, 13 were admitted, two were not admitted and one was already an inpatient. Of the 97 women, 51 (52.6%) were primiparae, the proportions in the admitted and non-admitted groups being 52.0% and 53.3% respectively. Twenty-four (24.7%) of the 97 women had a past history of one or more abortions (16.1% in the whole study group) of whom 19 were admitted.

As with bleeding at earlier gestations, self-referral was the main source of admission although at the later gestations seven admissions followed reporting of bleeding or an ultrasound diagnosis of placenta praevia at a routine visit to the antenatal clinic while two women were referred by their general practitioners. Again, as with earlier bleeding, virtually all self-referrals resulted in admission and where admission did not occur this was usually because bleeding was not reported at the time it occurred. The numbers presenting with bleeding increased with increasing gestation and although the numbers are very small and therefore of

limited significance, the admission rate appears to be rather higher above than below 30 weeks gestation (Table IX/II).

Eleven women were initially diagnosed as having placenta praevia and 12 as having abruptio placentae while 74 were initially categorised as bleeding of undetermined aetiology. The numbers admitted in each category and the confirmation of diagnosis according to whether or not the women were admitted are shown in Figure IX/V while the gestation at presentation for each category and the confirmation of diagnosis according to gestation at presentation are shown in Table IX/III.

Placenta Praevia

Of the 11 women thought to have placenta praevia, seven were admitted with confirmation of the diagnosis in three cases while one woman proved to have bleeding due to haemorrhoids. One woman was an inpatient at the time the diagnosis was made with confirmation of placenta praevia at delivery. The remaining three women were not initially admitted (none of whom had bleeding at the time the diagnosis was made) although two were admitted at a later gestation, one because of bleeding and one because of a further abnormal scan. In only one of these three cases was the diagnosis subsequently confirmed and this in the absence of bleeding antenatally. A further two women with bleeding at this stage in pregnancy had been shown to have a low-lying placenta in association with bleeding at <24 weeks gestation; in both the diagnosis had proved unconfirmed by the time bleeding at ≥24 weeks occurred and both had therefore already been reclassified as

"bleeding of undetermined aetiology". Six of the 11 women were at ⩾24⩽30 weeks gestation when the diagnosis was made, of whom two subsequently required delivery because of confirmed placenta praevia. Two were at >30<36 weeks gestation, of whom one had placenta praevia and one had bleeding haemorrhoids while three had the diagnosis made for the first time at ⩾36 weeks gestation with confirmation in two cases.

Abruptio Placentae

In 12 cases a clinical diagnosis of placental abruption was made; six presented with abdominal pain only, two with bleeding had previously bled at <24 weeks gestation while one woman who bled on this occasion had previously, in the absence of bleeding, had a low-lying placenta demonstrated on ultrasound but not subsequently confirmed. Nine women, three of whom had no bleeding, were admitted to hospital; the diagnosis was subsequently confirmed in all but one case which presented as pain without bleeding. The remaining three women were all inpatients when the diagnosis of placental abruption was made; none of these three women had bleeding and in none was the diagnosis confirmed. Of the 12 women, one, admitted at ⩾24⩽30 weeks gestation had the diagnosis confirmed at spontaneous delivery one week later. Four were at >30<36 weeks gestation, of whom two were delivered at that time with confirmation of the diagnosis while seven were at ⩾36 weeks gestation, of whom five proved to have had a placental abruption. Only one of the eight women with confirmed placental abruption was noted to be hypertensive but the hypertension only developed after delivery.

Bleeding of undetermined aetiology

Of the 74 women with bleeding of undetermined aetiology at ⩾24 weeks gestation (14 of whom had had bleeding at <24 weeks gestation), 57 were admitted (11 of whom had had earlier bleeding). Two of the women admitted proved to have bleeding of rectal origin. Four women were already inpatients, while 13 women were not admitted to hospital and in one case the bleeding was again shown to be rectal in origin. Of these 74 women, 14 presented at ⩾24⩽30 weeks gestation, of whom one was electively delivered because of recurrent bleeding later in pregnancy; in the other 13 cases no action was taken and no further bleeding occurred. Twenty-five women were at >30<36 weeks gestation, 19 of whom had no action taken and no further bleeding (two proved to have rectal bleeding), two women were electively delivered at this gestation because of their bleeding while four women were delivered at later gestations because of recurrent bleeding. Thirty-five women presented at ⩾36 weeks gestation; 15 were electively delivered while 20 (one of whom had rectal bleeding) had no action taken and no further bleeding.

Thus all women suspected of having placental abruption were managed as inpatients as were all women with suspected placenta praevia with the exception of one woman without bleeding in whom the diagnosis was not confirmed. Only in the case of bleeding of undetermined aetiology were significant numbers of women not admitted to hospital but the proportion admitted was higher where bleeding occurred above rather than

below 30 weeks gestation. Of the total of 97 women presenting at ≥24 weeks gestation only 13 (13.4%) ultimately proved to have an obstetric condition of known aetiology; 75 (77.3%) had bleeding for which no definite diagnosis could be made, four women proved to have bleeding which was not vaginal in origin while the remaining five women never bled antenatally and did not ultimately prove to have an obstetric condition with bleeding potential.

The numbers presenting with bleeding of undetermined aetiology increased with increasing gestation both according to initial and final diagnoses. While the numbers are extremely small, it appears that placental abruption also presented with increasing frequency as the gestation increased while placenta praevia tended to be diagnosed less frequently at greater gestations; the numbers in these two groups are too small to allow any comment on diagnostic accuracy at different gestations. Of the women suspected of having placenta praevia none had an elective early delivery without confirmation of the diagnosis as was the case with those suspected of having had a placental abruption with the exception of one woman electively delivered by caesarean section at 35 weeks gestation without the diagnosis being confirmed. Among those with bleeding of undetermined aetiology, the apparently arbitrary selection of cases for delivery presumably reflects differences in severity of bleeding not apparent in a retrospective review.

Mode of Delivery and Pregnancy Outcome

A. Bleeding at <24 weeks gestation

Of the 92 women with bleeding at <24 weeks gestation, seven (7.6%) delivered at <37 weeks gestation (6.4% in the whole study group) and 16 (17.4%) were delivered by caesarean section (14.4% in the whole study group). There were no perinatal deaths in this group, 12 babies (13.0%) weighed less than the 10th centile for gestation (9.9% in the whole group) and seven (7.6%) were admitted to the special care nursery for more than 48 hours (5.0% in the whole group). Thus although these numbers are very small and therefore of limited significance, there does not appear to have been any marked increase in fetal mortality or morbidity in association with bleeding at <24 weeks gestation.

B. Bleeding at ≥24 weeks gestation

Of the 88 women who proved to have an obstetric condition with bleeding or bleeding potential at ≥24 weeks gestation, 14 (15.9%) delivered at <37 weeks gestation (6.4% in the whole study group) and 21 (23.9%) were delivered by caesarean section (14.4% in the whole group). The perinatal mortality rate was 22.7/1000 (5.4/1000 for the whole group) based on two deaths although there was also one late infant death apparently due to intrauterine growth retardation. (The baby weighed 710g at 33 weeks gestation.) Seventeen babies (19.3%) weighed less than the 10th centile for gestation (9.9% in the whole group) while seven (8.0%) were admitted to the special care nursery for more than 48 hours (5.0% in the whole group). These data are shown in

Table IX/IV. Although the numbers are very small, there would thus appear to be an increased rate of abdominal delivery with increased fetal mortality and morbidity in this group of women.

Low-lying Placenta on Ultrasound

Nineteen women (1.5% of the study group) had a low-lying placenta demonstrated ultrasonically at some stage in pregnancy. In eight cases this diagnosis was first made at <24 weeks gestation and in three of these the diagnosis was made in the absence of bleeding; in none of these eight cases was the diagnosis subsequently confirmed. In six cases, one without bleeding, the diagnosis was first made at ⩾24⩽30 weeks gestation. Of the women who bled, two subsequently had the diagnosis confirmed. Two women had the diagnosis made in the presence of bleeding at >30<36 weeks gestation with confirmation in one case. The remaining three women first had the diagnosis made at ⩾36 weeks gestation, in two cases in the absence of bleeding. Two of these three women, one with bleeding and one without, subsequently proved to have placenta praevia. Thus the frequency with which the diagnosis was made fell with increasing gestation but the proportion in whom the diagnosis was not subsequently confirmed simultaneously fell. When the diagnosis was made before 24 weeks gestation it subsequently proved unconfirmed in 100% of cases so, conversely, no woman who ultimately proved to have placenta praevia had an abnormal scan or experienced bleeding before this gestation.

Discussion

In this study of women delivering at ⩾24 weeks gestation, the total incidence of bleeding in singleton pregnancies was 12.7%; this compares with rates for all women of 6.0% (Butler and Bonham, 1963) and 10.5% (Chamberlain et al, 1978) in national surveys of deliveries at ⩾28 weeks and ⩾24 weeks respectively. In this study, the proportion of women with bleeding prior to 24 weeks was 7.1%, the rates for bleeding prior to 28 weeks in the national surveys being 3.4% and 4.7% respectively. In the earlier national survey, 3.1% of women bled after 28 weeks gestation while an equivalent figure is not available for the later survey since in one-third of those who bled the gestation at which this occurred was not recorded. Paintin (1962) quotes a rate of 3.0% for bleeding after 24 weeks gestation while the corresponding rate for this study was 6.8%. Thus the overall incidence of bleeding in this study was greater than in these other published works with higher rates at all stages of pregnancy. Inaccuracies and under-reporting , which are problems of all retrospective studies, will undoubtedly be responsible for some of the differences in observed rates; the different gestational criteria for inclusion in and subdivision of the study populations is a further source of variation. Some cases of "show" may also be included here although only those women in whom spontaneous labour did not occur within 24 hours were recorded as having bleeding of undetermined aetiology. Nevertheless, there is no obvious reason why the incidence of bleeding should be higher at all stages of pregnancy in this study.

There are no easily measurable parameters for accurate quantification of bleeding either by the woman herself or by trained hospital staff; similarly described episodes of bleeding may thus in fact be very different. Consequently a retrospective study such as this provides information on management policies in only very general descriptive terms.

Bleeding <24 weeks gestation

As already noted, no conclusions can be drawn from a study such as this on the therapeutic efficacy of hospitalisation for bed rest in threatened abortion since, by the design of the study, those with an unfavourable outcome at <24 weeks have been excluded. Earlier work, however, has already suggested that no benefit in terms of pregnancy outcome accrues from such management (Diddle et al, 1953). If hospital admission in threatened abortion does not benefit the fetus, it must presumably be viewed as in the maternal interests. In the event of bleeding progressing to inevitable abortion with significant haemorrhage the woman would be in a situation where expert care is immediately available; in less unfavourable circumstances admission would allow monitoring to confirm an ongoing pregnancy and might reassure the woman or her medical attendants that something positive is being done. Pain accompanying the bleeding of threatened abortion is generally viewed as a poor prognostic sign suggesting progression to inevitable abortion is likely and in this situation admission could be easily justified. Not surprisingly, however, pain was rarely a feature of the bleeding reported by women in this study for whom the case for admission is consequently weaker.

Similarly admission to allow monitoring of the pregnancy is questionable since in most cases this could be carried out on an outpatient basis.

It was not apparent from the case records why some women reported bleeding while others did not. A past history of pregnancy loss might be expected to cause increased anxiety and consequently increased reporting of bleeding but this was obviously not a major factor. It is probable that to some extent the women's reactions reflect differences in severity of bleeding not apparent in a retrospective study. Nevertheless, while many women presenting with threatened abortion are unbooked there appears to be uncertainty even among those who have already attended the antenatal clinic as to whether or not such bleeding should be reported. Thus the decision regarding admission appears to rest largely with the woman in that where bleeding was reported at the time it occurred admission followed almost invariably. Such management might be regarded as implying a medical view that admission is indicated in all cases of threatened abortion. It may be, however, that the woman's arrival at the hospital is seen as a "fait accompli"; since such admissions often occur outwith normal working hours and since the woman is usually seen by the most junior members of the medical staff, admission in these circumstances may be regarded as expedient for either or both parties concerned. For all women, however, admission is disruptive and for many it is extremely difficult or impossible because of domestic and economic pressures. They should, therefore, be aware of the limited potential benefits of hospital

admission so that those who choose to remain at home do not have imposed on them a sense of responsibility for any subsequent poor outcome.

Bleeding ⩾24 weeks gestation

The incidence in this study of bleeding at ⩾24 weeks gestation was 6.8% although if those women with placenta praevia or placental abruption without vaginal bleeding are included the figure is 7.1%. As noted, this compares with the rates in other studies of 3.0% (Paintin, 1962) and 3.1% (Butler and Bonham, 1963) at ⩾24 weeks and ⩾28 weeks respectively. Placenta praevia occurred with the same frequency in these two studies, the 1970 British Births Survey (Chamberlain et al, 1978) and the present study, the rates being 0.4%, 0.5%, 0.5% and 0.4% respectively. The corresponding rates for placental abruption are 0.7%, 0.4%, 1.2% and 0.6% while those for bleeding of unknown aetiology are 1.8%, 2.2%, 2.4% and 5.8%. It would thus appear that the increased incidence of antepartum haemorrhage in this study was due to an increased incidence of bleeding of undetermined aetiology. Doubtless this group is not aetiologically homogeneous. While none of these women had an abnormally sited placenta demonstrated it is possible some minor degrees of placenta praevia are included in this group. More likely, however, is that in a number of these cases bleeding was due to a mild degree of placental abruption which was not diagnosed. Some of the increase in numbers in this group might be due to the inclusion of cases where bleeding was cervical or vaginal in origin; thus while

four cases of rectal bleeding were identified, the remaining women with genital tract bleeding were not all examined for possible local causes. The increased rate of abdominal delivery and increased fetal morbidity shown in the other studies is confirmed here; these increased rates occur largely among women with placenta praevia and placental abruption, the caesarean section rate being highest in the former group while fetal morbidity was highest in association with placental abruption.

As with earlier bleeding, the main factor determining admission was whether or not the woman reported the bleeding at the time it occurred; the increased admission rates at later gestations are thus due to increased reporting of bleeding.

Where placenta praevia was diagnosed on ultrasound examination carried out because of bleeding, all women were treated as inpatients; thus the three women who were not admitted did not bleed, the abnormal placental site being an incidental finding on a scan performed for other indications. All five confirmed cases were delivered by caesarean section as would be expected while no woman was delivered by section for this indication without confirmation of the diagnosis. By the time delivery occurred there appeared to be confidence in the diagnosis in that only one woman had a vaginal examination in theatre prior to delivery; in that case the diagnosis was disproved and she delivered vaginally.

There also appeared to be a reasonable consensus of opinion on management of suspected placental abruption. Again all were treated as inpatients and where the fetus was alive on admission vaginal delivery was only permitted where intrapartum monitoring was satisfactory; one woman with abdominal pain but no bleeding was delivered by caesarean section without confirmation of the diagnosis.

As has been noted, the incidence of bleeding of undetermined aetiology was higher in this study than reported elsewhere and it was in this group that a number of women were not admitted, mainly because the bleeding was not reported. While an accurate estimation of the severity of bleeding is difficult at the time and even less possible retrospectively, it seems likely that in a large number of cases bleeding was slight since many of the pregnancies so affected continued for several weeks thereafter. Where bleeding occurred at early gestations intervention was rarely used but where early delivery was carried out it appeared from the case records that bleeding was considered more severe. Where bleeding occurred close to term a number of women went into spontaneous labour a few days later but a number were also electively delivered. It might be expected that bleeding was again heavier in those delivered than in those whose pregnancies were allowed to continue; although this may have been so it was not apparent from the case records but it was noticeable that where bleeding was recurrent the threshold for intervention was lower.

There would thus seem to be little question about the management of threatened abortion where pain is a feature, severe bleeding at any gestation or clinical situations in later pregnancy where a diagnosis of placenta praevia or placental abruption seems likely. It is in the case of mild painless bleeding in early pregnancy or minor degrees of later bleeding without evidence of either of the major diagnoses that the role of hospital admission is less clear. The majority of women who bled fell into one or other of these two categories which together were responsible for the overall increased incidence of bleeding in this study; more definite management policies for such cases are therefore required. These might reasonably include increased management on an outpatient basis; where admission to hospital is used the objectives of such management should be identified. Clear guidelines should be given to pregnant women on the procedure to adopt should bleeding occur at any stage in pregnancy.

	Bleeding			No Bleeding		
	<24 wks only	⩾24 wks only	Before and after 24 wks	Suspected abruptio placentae	Low-lying placenta	Total
No. of women	76	73	16	6*	4+	175
	43.4%	*41.7%*	*9.1%*			*100%*

TABLE IX/I : GESTATION AND MODE OF PRESENTATION FOR BLEEDING AND RELATED CONDITIONS

(* All presented >24 weeks gestation)
(+ 2 presented <24 weeks gestation; 2 presented ⩾24 weeks)

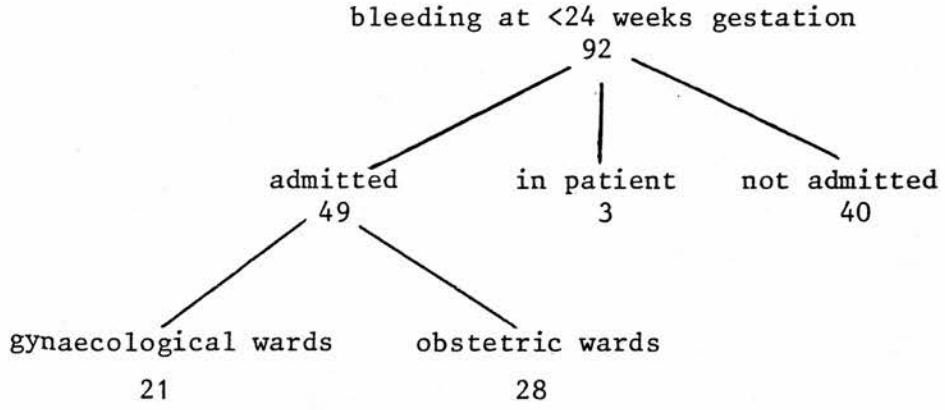


FIGURE IX/I : ADMISSION RATES FOR BLEEDING <24 WEEKS GESTATION

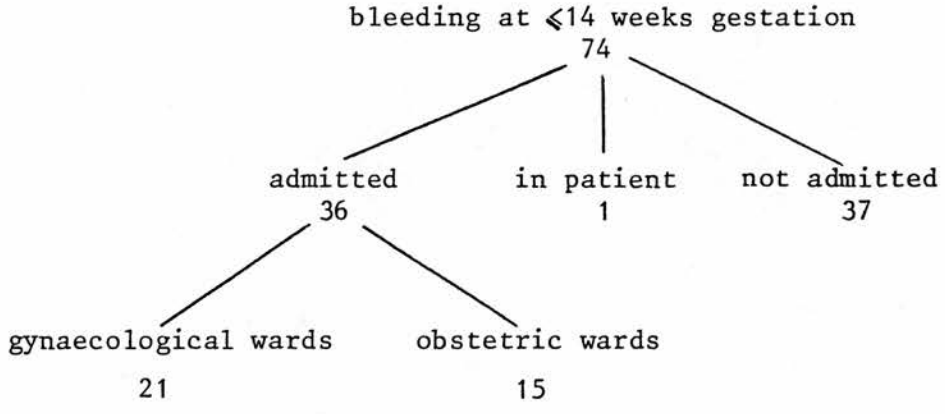


FIGURE IX/II : ADMISSION RATES FOR BLEEDING ⩽14 WEEKS GESTATION

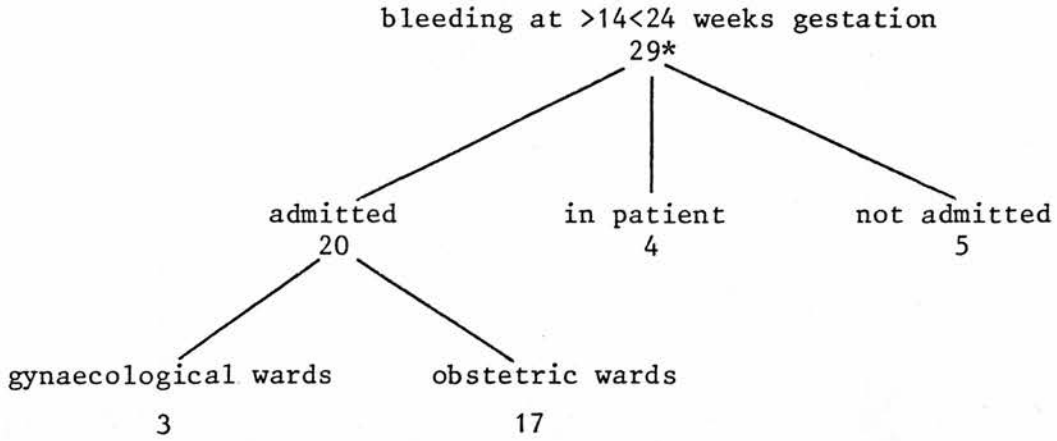


FIGURE IX/III : ADMISSION RATES FOR BLEEDING >14<24 WEEKS GESTATION

(* includes 11 with previous bleeding ⩽14 weeks gestation)

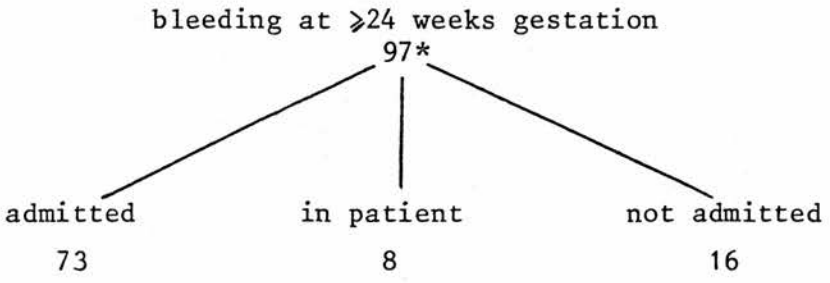


FIGURE IX/IV : ADMISSION RATES FOR BLEEDING ⩾24 WEEKS GESTATION

(* includes 16 with previous bleeding <24 weeks gestation)

	≥24<30 wks	>30<36 wks	≥36 wks	Total
Admitted	12	26	35	73 *75.3%*
Not admitted	6	4	6	16 *16.5%*
In patient	3	1	4	8 *8.2%*
Total	21 *21.6%*	31 *32.0%*	45 *46.4%*	97 *100%*

TABLE IX/II : ADMISSION RATES BY GESTATION AT PRESENTATION FOR BLEEDING ≥24 WEEKS GESTATION

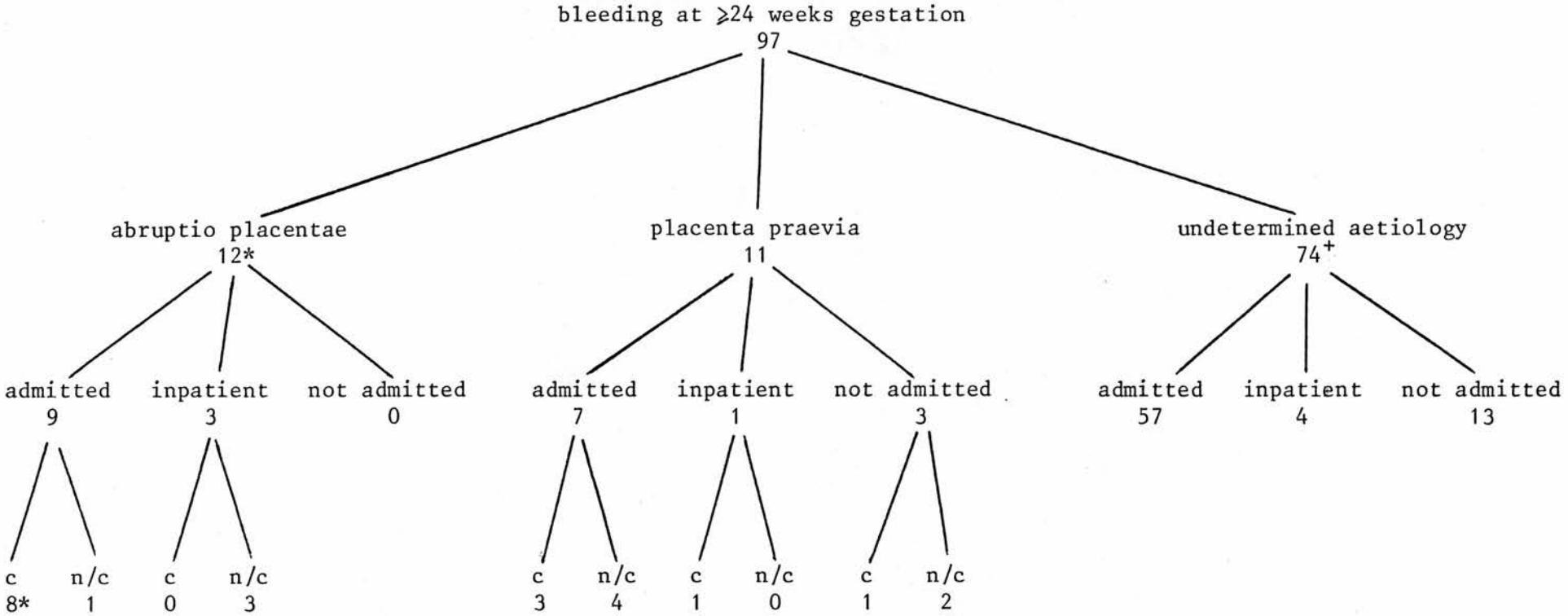


FIGURE IX/V : SUSPECTED AETIOLOGY, ADMISSION RATES AND CONFIRMATION OF DIAGNOSIS FOR BLEEDING ≥24 WEEKS GESTATION

(* includes 2 women with previous bleeding <24 weeks gestation
+ includes 14 women with previous bleeding <24 weeks gestation)

c = confirmed
n/c = not confirmed

	⩾24⩽30 wks	>30<36 wks	⩾36 wks	Total
Undetermined aetiology	14 (17)	25 (23)	35 (35)	74 (75)
Abruptio placentae	1 (1) *	4 (2) *** *	7 (5) *** *	12 (8)
Placenta praevia	6 (2) *	2 (1)	3 (2) * *	11 (5)

TABLE IX/III : GESTATION AT PRESENTATION FOR DIFFERENT AETIOLOGIES OF BLEEDING ⩾24 WEEKS GESTATION BY INITIAL AND FINAL DIAGNOSES

(N.B. numbers in parentheses = final diagnosis
* = number of women with no bleeding antenatally)

	Preterm delivery <37 wks	Caes. section	Peri-natal death	IUGR	Admitted to SCN ⩾48 hrs	Total no. of women
Undetermined aetiology	6	14	0	14	5	75
Abruptio placentae	6	2	2	2	2	8
Placenta praevia	2	5	0	1	0	5
All aetiologies	14	21	2	17	7	88

TABLE IX/IV : PARAMETERS OF PREGNANCY OUTCOME IN THE THREE CATEGORIES OF BLEEDING

CHAPTER X - MANAGEMENT OF SPECIFIC PROBLEMS: SUSPECTED INTRA-UTERINE GROWTH RETARDATION

Many clinical tests have been introduced in an attempt to identify antenatally those babies who are small for gestational age, those with a weight for gestational age of less than the tenth centile being traditionally referred to as "growth retarded". While many such babies are perfectly normal and healthy a proportion are truly at risk and the perinatal mortality rate for this group as a whole is higher than for the whole population. Considerable energy has therefore been directed towards antenatal identification of these babies as constituting an at risk group requiring further investigation.

Of the 1302 women in this study, the case records of 85 (6.5%) with singleton pregnancies contained an explicit comment indicating a suspicion of growth retardation. Forty (47.1%) were primiparae and 14 (16.5%, 1.1% of the study sample) were admitted antenatally because of this suspicion spending a total of 150 days in hospital (3.0% of the total days for the whole group). While in 43 cases (50.6%) the question of poor fetal growth was first raised between 30 and 36 weeks gestation, in 24 (28.2%) it was first noted at $\geqslant$36 weeks.

Thirty-four (40%) of the 85 babies suspected of being small for dates did in fact weigh less than the tenth centile for gestation according to the Aberdeen growth curves (Thomson et al, 1968). This was 2.6% of the total sample. Thus for every two correctly identified small for dates babies there were three false

positives. Of these 34 women, 26 had investigations carried out (Figure X/I). There was no apparent reason for the selection of cases to be investigated; there was no difference in the occurrence of current pregnancy problems and the incidence of past obstetric problems was marginally higher in the non-investigated group. Of the 26 women who were investigated, 11 had normal results for all tests. Nine of these 11 had no further tests or action (defined as an antenatal admission for further fetal monitoring or elective delivery before 38 completed weeks). The remaining two women were both admitted for further monitoring with subsequent normal results. Despite this, one woman was electively delivered at 37 weeks. Fifteen of the 26 investigated women had abnormal or mixed results. In six cases these abnormal results prompted some kind of action but it was not clear why similar results did not prompt action in the other nine. There was no difference in the birthweight distribution between cases with normal or abnormal results. In all of the six cases where action followed the tests, this initially consisted of an admission for further antenatal monitoring ranging from five to 24 days with two women having two admissions. In these six cases, inpatient investigations produced abnormal or mixed results. In two cases, further action was taken in the form of elective delivery at less than 38 completed weeks; these babies were in fact the smallest for gestational age in the suspected group (1750g at 37 weeks and 710g at 33 weeks). A further three were electively delivered because of concern about fetal growth but in these cases delivery was after 38 weeks. While in 24 (28.2%) of the 85 women suspected of having growth retardation the question did not arise until $\geqslant$36 weeks, the proportion

in confirmed cases was 38.2% and in six of these 34 cases it was only raised at >38 weeks gestation.

Fifty-one babies were incorrectly suspected of being small for dates; in 39 of these investigations were carried out (Figure X/II) whereas in the remaining 12 cases no investigations occurred. There was no obvious reason in terms of previous or current pregnancy complications or a history of growth retardation for the selection of cases that were investigated. Of the 39 women investigated, 23 had normal results for all tests. In these cases no further attention was paid to the problem. Sixteen of the 39 women, however, had abnormal or mixed results and in six of these false positive cases further action was taken. In all six cases, action initially consisted of an antenatal admission for further monitoring. These admissions lasted from one to six weeks and two women were admitted on two or more occasions. In four cases this further monitoring produced normal results but in two cases results were mixed. In one of these two cases no further action was taken but the second woman was delivered at 35 weeks gestation by elective caesarean section. Her past obstetric history included two perinatal deaths. In the ten cases with abnormal results but no action, three initially had abnormal results (predominantly ultrasound and oestriols) followed by normal and thus reassuring results. In the remaining seven cases there was no apparent reason why the abnormal results did not prompt further action.

In the total study group of 1302 there were 129 (9.9%) babies

with weights below the tenth centile, 61 (47.3%) of these mothers were primiparae (44.2% in the whole study group), the rate of growth retardation in primiparae and multiparae being 10.6% and 9.4% respectively. The antenatal detection of 34 of these 129 babies thus represents a pick-up rate of 26.4%. Figure X/III illustrates the centile distribution in the suspected and unsuspected groups. There was a slight tendency to detect the smaller babies more frequently but it is not significant.

As a measure of morbidity, the 129 small for dates babies were classified according to whether they had been admitted to the special care baby unit (SCBU), whether the admission had been for more or less than 48 hours and whether the baby was discharged home with the mother. Table X/I gives the results. Of the 34 suspected and confirmed small for dates babies, eight were admitted to the SCBU for more than 48 hours, of whom seven were unable to go home with the mother. Of these seven babies, however, one had a congenital abnormality and one was asphyxiated following placental abruption. There were no stillbirths or neonatal deaths among these 34 babies but there was one late infant death. Among the 95 unsuspected babies, 14 were in the SCBU for more than 48 hours of whom nine did not go home with the mother. One of these nine however was a healthy boarder in the nursery. There were three deaths among these 95; two were normally formed (1190g at 37 weeks and 1920g at 36 weeks). The third baby had a severe fetal abnormality and weighed 2770g at 39 weeks.

Seven hundred and twenty-seven women in the study group were multiparae of whom 103 (14.2%, 7.9% of the total study group) had a history of a previous baby with birthweight less than the tenth centile. Of these 103, 31 (30.1%) in the current pregnancy had small for dates babies and were responsible for 24.0% of the total small babies. In 15 of these 103 women growth retardation in the current pregnancy was suspected; in six this was confirmed but nine were false positives. This rate of three false positives for every two correctly identified small babies is identical to the overall rate. Of the six correctly identified babies, one had no investigations carried out, two had normal results for all tests while three had abnormal results. In two of these three cases no action was taken but the third woman was admitted for further monitoring with abnormal results and electively delivered at 33 weeks gestation; the baby, which weighed 710g, was the most severely growth retarded in the suspected group.

Discussion

A fetal weight less than the tenth centile for gestation is conventionally defined as growth retardation and is still widely regarded as a major obstetric problem (Report of RCOG Working Party, 1984). Estimating fetal size, therefore, is a routine part of antenatal care.

Recent reviews of the detection of growth retardation in hospital practices (Hall et al, 1980; Rosenberg et al, 1982) have reported a pick-up rate of small for dates babies of about 50%. In the Aberdeen survey there were three false positives for every

actual case found. In this study, although the sensitivity was half that in Aberdeen, i.e. 26%, the false positive rate was also halved.

In spite of continued concern with diagnostic techniques (Lilford et al, 1983; Dornan et al, 1984), the efficiency of detection remains disappointing. Biochemical screening methods (Aickin et al, 1983) have been shown to be of limited value. Even the promising results from a two-stage ulstrasound programme (Neilson et al, 1984) which identified 94% of cases of small for dates babies with a specificity of 90%, resulted in 10% of the normal population falsely identified as less than the tenth centile. In this study of clinical practice the lack of a significant difference in birthweight distribution between suspected and unsuspected cases highlights the lack of precision of available tests. The apparently arbitrary selection of cases for investigation reflects clinical awareness of this fact.

An important indicator of risk is considered to be a past history of growth retardation. The incidence in this study was indeed more than three times higher among these women who, moreover, while comprising only 7.9% of the whole study group, were responsible for 24.0% of the small for dates babies; nevertheless, while 31 women with this past history again had a small for dates baby, 72 (69.9%) did not. Thus, while the relative risk for these women is considerably higher, the absolute risk is too low to make this fact of use in clinical management.

The crude perinatal mortality rate (23.3/1000 based on three deaths) among the 129 babies under the tenth centile was higher than in the study group or the hospital population as a whole (5.4 /1000 and 7.6/1000 respectively). All three perinatal deaths occurred in the unsuspected group, although there was an infant death among the suspected babies which was related to growth retardation. One of the three perinatal deaths was due to Potter's Syndrome, leaving two deaths apparently directly related to growth retardation. The number of deaths is so small, however, that these figures are of limited significance.

Morbidity among the small for dates babies was higher (17% were admitted to the SCBU for more than 48 hours) than for the study group as a whole (5%) but there was no significant difference in morbidity between the suspected and unsuspected groups. The pick-up rate of babies with real clinical problems was 32% (Table X/II). Thus, although mortality and morbidity were higher in those babies weighing less than the tenth centile, only a small minority had clinical problems. While the rate of detection of small babies was low, the rate of pick-up of sick babies was equally low. Finally, detection appeared to have little influence on these measures of outcome.

Detection rates can be improved but false positive rates remain unacceptably high. In this study group, 39 of the 51 false positives had investigations as outpatients and six of the 16 with abnormal results were admitted antenatally for from one to

six weeks. One woman was electively delivered at 35 weeks gestation. This cost of managing the false positives must be considered in any evaluation. It has been recommended (Neilson et al, 1984) that greater efficiency would be achieved by not applying screening programmes to low risk pregnancies; unfortunately, the accurate identification of low risk pregnancies is not currently possible.

These results confirm earlier anxieties about the unsatisfactory management of this condition at present. The poor pick-up rate in practice has been confirmed and when considered in conjunction with the lack of effect which detection has on mortality and morbidity and the cost of unnecessary intervention in false positives, the priority would appear to be to concentrate on tests of fetal well-being rather than fetal size and to evaluate their effectiveness in controlled trials.

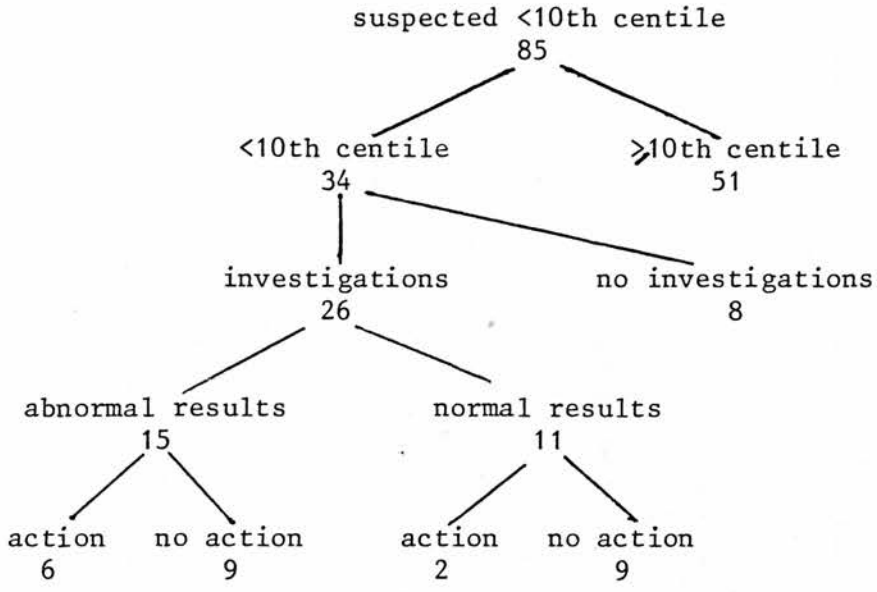


FIGURE X/I : NUMBERS AND MANAGEMENT OF SUSPECTED AND CONFIRMED SMALL FOR GESTATIONAL AGE BABIES

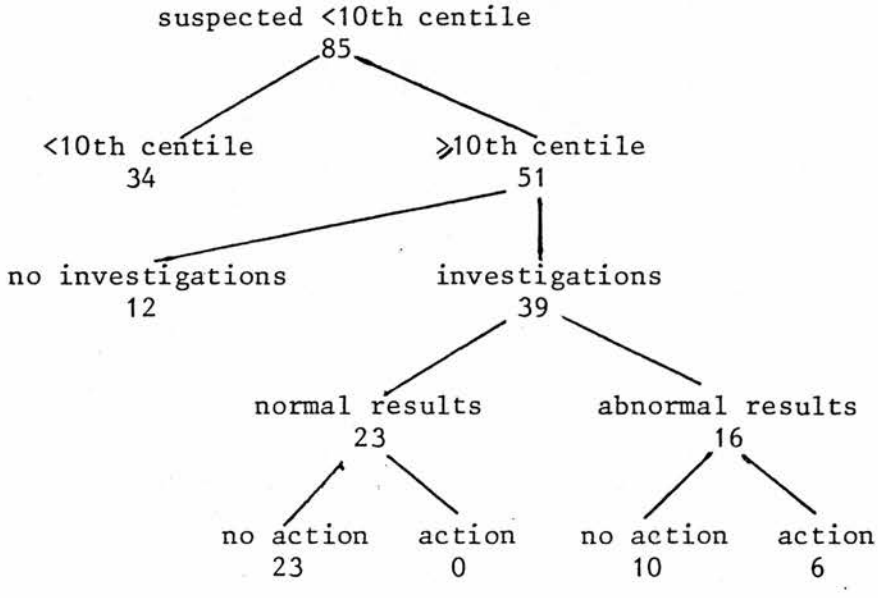


FIGURE X/II : NUMBERS AND MANAGEMENT OF FALSE POSITIVES

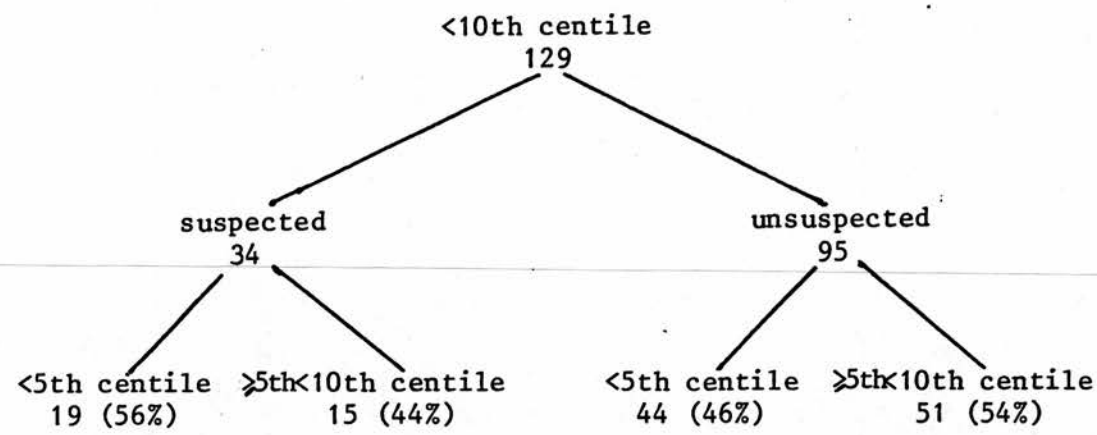


FIGURE X/III : BIRTHWEIGHT CENTILES IN SUSPECTED AND UNSUSPECTED BABIES

	Perinatal deaths	SCBU ⩽48 hrs	SCBU >48 hrs	Not discharged with mother
Suspected (34)	0	2	8*	7
Unsuspected (95)	3	4	14	9**
Total (129)	3	6	22	16

(*one late infant death **one healthy boarder)

TABLE X/I : MORBIDITY IN BABIES LESS THAN THE TENTH CENTILE

	Perinatal deaths	SCBU >48 hrs	Total
Suspected	0	8	8(32%)
Unsuspected	3	14	17(68%)
Total	3	22	25(100%)

TABLE X/II : DETECTION OF ILL BABIES

CONCLUSIONS

Since its introduction more than 80 years ago with the establishment of one bed for the purpose, antenatal inpatient care has expanded enormously and now comprises a very significant proportion of obstetric care; in this study almost half the women were admitted for more than 24 hours on at least one occasion antenatally and in Glasgow Royal Maternity Hospital, as in many others, the proportion of beds designated as antenatal, while variable, often approaches that allocated to postnatal care.

While the initial objectives of inpatient care were vague and illdefined, they broadly covered two main categories, namely problems which predated the pregnancy and problems which arose during the course of the pregnancy; the former category included essentially healthy women whom it was felt would benefit from being removed from their home environment and admitted to hospital for rest. As already noted, serious intercurrent disease is now rarely encountered in obstetric practice while previous obstetric problems, adverse demographic features, social problems or simply rest for unspecified reasons were only very occasionally cited as indications for admission. Thus in this study antenatal admissions largely resulted from complications which arose during the current pregnancy; further, a relatively small number of conditions were responsible for the majority of admissions and were broadly covered by the four categories of abdominal pain, hypertensive disease, bleeding and suspected poor fetal growth. In the case of hypertension and suspected poor fetal growth, admission was usually initiated by medical staff while women with abdominal pain or bleeding were

generally admitted as a result of self-referral to hospital.

All these conditions cover a broad spectrum of severity, at one extreme posing a serious threat to the health or even the life of mother or baby while at the other extreme there is little or no risk to either. Common to all these problems is a difficulty not only in making the diagnosis but of identifying either the point in the spectrum involved or the likelihood of subsequent progression of severity and thus the degree of risk in any particular instance. While at the severe end of the spectrum for any of these complications admission to hospital is clearly justified, for milder conditions the indications for admission, or at least prolonged admission, are less clearcut with the benefits of inpatient management yet to be proven. Clearly many women were admitted because of the fear that they might develop progressively more serious complications; such serious complications, however, often presented as such with no history of a preceding mild but progressive disorder. Moreover, as for example in the case of hypertension, selection of cases for admission often appeared to be inappropriate if features of demonstrated prognostic significance are considered. While clearer knowledge of the natural history of such disorders would be helpful, greater attention to the information already available might avoid some unnecessary or unnecessarily prolonged antenatal admissions. Even if inpatient status were deemed necessary for initial investigations, it seems likely that many of the women could have been subsequently followed up as outpatients.

The inadequacy of available screening tests or diagnostic

investigations was demonstrated by the apparently random way in which they were carried out or their results acted upon. For those women with pregnancies at or near term, delivery often appeared to offer a solution to the dilemma and indeed for many obstetric problems delivery remains the only method of treatment. While an awareness of the lack of precision of available tests may often have been responsible for the seemingly random pattern of subsequent action, in a number of cases it appeared that administrative factors and communication problems were to blame. Thus, for example, while some cases of asymptomatic bacteriuria may have been left untreated as a positive decision, it seems likely that this was sometimes due to oversight; this was clearly the case in those instances where treatment was given but proved ineffective. Suspected symptomatic urinary tract infection led to the submission of hundreds of urine samples for culture yet management of those cases with proven infection was disappointingly inefficient. There seems little point in carrying out investigations if the results are to be disregarded or of admitting women to hospital unless this can be shown to be beneficial. Where results are ignored because the test is known to be inaccurate, such use of resources is unjustified; where lack of action is due to oversight more effective communication and clearer management policies are required. Where an adverse outcome follows intensive inpatient investigation both the woman and hospital staff may feel reassured that everything possible has been done and consequently view such an outcome as unavoidable; however, if the tests, albeit of limited or of no value, are performed but subsequently ignored, criticism would appear to be more justified than with a policy of inactivity.

Despite recent trends to the contrary, women remain generally willing to accept whatever is recommended to them either in their own or their baby's interest (Riley, 1977). In this study, many admissions appeared to be precautionary measures to reassure medical staff and relieve them of the onus of responsibility; should the woman be unable to comply with this recommendation she would then bear the responsibility for any subsequent adverse outcome. When assessing possible benefits of antenatal inpatient care, consideration must also be given to the costs in social and medical as well as financial terms of unnecessary admissions and interventions for women with no significant risk.

In the current climate of economic stringency, use of resources comes under increasing scrutiny. Postnatal bed requirements can be assessed on the basis of variable but fairly well defined factors; thus such calculations can be made with a knowledge of the birth rate, the proportion of women for whom hospital delivery is thought to be indicated (now considered to be 100%), the duration of postnatal stay in hospital and the percentage bed occupancy deemed to be appropriate. Recommendations have therefore changed with time in accordance with variations in birth rate and views on service needs. Assessment of antenatal bed requirements involve more arbitrary calculations. The Cranbrook Report (1959) on maternity services in England and Wales recommended that antenatal beds should be provided for 20-25% of all confinements while the Montgomery Report (1959) on services in Scotland recommended provision of not less than 8 beds per 1000 deliveries per year for antenatal admissions. Total obstetric bed requirements as

calculated by the Scottish Home and Health Department assume a throughput of 30 women per bed per year; this derives from the Peel Report's (1970) figure of 40 women per postnatal bed per year with the recommendation that a further 25% at least should be allowed for antenatal use. While the report noted a slight rise over the previous decade in the proportion of beds used for antenatal care and predicted that a subsequent reduction in needs was unlikely, it acknowledged that prediction of future needs was difficult; nevertheless, antenatal bed requirements were seen as being in parallel with postnatal bed requirements with predictions on future needs based on a ratio between the two which, while fairly constant, was arbitrarily derived from practices current at that time. Similarly, the Short Report (1980) identified such a ratio between antenatal and postnatal beds. In Scotland antenatal discharges as a percentage of deliveries in major hospitals rose from 21% in 1970 to 32% in 1978 and 37% in 1982. The figure for GRMH in 1982 was 44%; while this is not strictly comparable to the rate of 49% in this study, since it includes women attending as day cases and excludes those remaining in hospital until delivery, it does appear that the rate continues to rise and certainly it is currently appreciably higher than that considered appropriate by the Peel Report and slightly higher than that quoted by the Short Report. The Short Report emphasised the importance of establishing norms for obstetric beds. Any calculations based on such figures, however, are also based on the assumption that current practices are correct, yet such an assumption is not justified since not only is there a lack of data describing current practices but, in the

majority of conditions managed by antenatal admission, any benefit from such management has yet to be proven.

While the numbers in this study are relatively small and reflect policies in only one hospital, it seems probable that practices in other hospitals are not too dissimilar since many of the problems illustrated here apply universally. Thus while not providing proof of benefit or lack of benefit from inpatient management in the various obstetric complications described, this study does identify several major problems and indicates those areas which merit further investigation. Firstly, there is a need for more information describing current practices throughout the country as a whole. Once the conditions responsible for antenatal admissions have been identified, with the exception of a few serious problems, the possible benefits of inpatient care in such conditions should be evaluated in prospective randomised controlled trials. The question of such evaluation, however, highlights a further serious problem, namely the difficulty in diagnosing these disorders and identifying women at serious risk. The lack of precision of available investigations has been demonstrated and clearly there is a need for more accurate diagnostic and prognostic tests. Prognostication would also be facilitated by epidemiological study of these disorders of pregnancy and where the natural history of a condition is already established such information merits much greater consideration. Those women likely to develop serious complications could thus be identified allowing selection of cases for admission on a more rational basis.

Even if the results of this study are confirmed by investigation on a larger scale it could not necessarily be inferred that all those women with minor disorders should not have been admitted to hospital. This study merely demonstrates an apparent lack of benefit from admission for the indications stated. While social factors were rarely cited as the reason for admission, it appeared these may, on occasion, have influenced the decision and this may account to some extent for the apparently random selection of patients for admission. With current financial pressures, such admissions are viewed by many as something of a luxury and there seemed to be a desire to justify admissions on rather more scientific grounds. Ballantyne identified this as an area where antenatal admissions would be indicated; while the Cranbrook and Montgomery Reports considered social problems an indication for hospital delivery, the Peel Report acknowledged that

> "the provision of antenatal beds should be related statistically to the births in the area served having regard to the health of the community and its social character".

Many of the complications leading to poor pregnancy outcome are more common in lower socioeconomic groups due to the effects, both direct and indirect, of a number of inter-related factors. Women admitted to hospital antenatally are generally viewed as being ill and the emphasis in recent years has been on technological advances in obstetric therapeutics. It is possible that women from lower socioeconomic backgrounds might benefit from hospital admission with inpatient management rather less technologically based and, moreover, might additionally benefit in ways not immediately apparent from the obstetric indices currently used to assess

pregnancy outcome.

It seems likely from this study that many women are being unnecessarily admitted to hospital antenatally. While such admissions may reassure medical staff they cause the women considerable anxiety and domestic upheaval and there seems to be further wastage of resources on unnecessary or unhelpful investigations. It is possible the problem is not that too many women are admitted to hospital but that reasonable objectives have not been defined nor the areas identified where benefit might result. Perhaps what is needed is a change in emphasis and a reappraisal of the criteria by which benefit is currently measured.

SUMMARY

This study begins by examining the history and development, first of obstetric care, then of antenatal outpatient, and later inpatient, care with particular reference to the Glasgow Royal Maternity Hospital on whose population of women this study is based. Factors responsible for the introduction of antenatal care are discussed and the initial aims and objectives of antenatal inpatient care identified. Thus, at its inception, such inpatient care was considered appropriate for three main groups of women:

1) Those with problems which predated the current pregnancy, either as intercurrent disease or previous pregnancy problems;

2) Those who developed complications during the course of the current pregnancy;

3) Some essentially healthy women who, because of social or domestic factors, would benefit from admission to hospital for rest.

In this historical context current practices are then examined.

Methods of Study

A sample of 1302 women were selected for study, being a random one-third of all women who delivered in Glasgow Royal Maternity Hospital in 1983. For all these women demographic data together with details of past obstetric histories and current pregnancy outcome were obtained from the Scottish Morbidity Record II (S.M.R.2). Details of current pregnancy complications, their investigation,

treatment, outcome, and whether they were treated on an inpatient or outpatient basis were obtained directly from the case records. Computer analysis provided basic data which allowed comparison of the group of women admitted antenatally with those not admitted, assessment of the incidence of the complications recorded, and identification of the complications most commonly responsible for antenatal admission.

Pre-existing Risk Factors

While adverse demographic features or a bad obstetric history could directly cause antenatal admissions, there might also be, by a lowering of the threshold for action or intervention, an indirect effect on admission rates. The two groups of women were, therefore, compared in terms of these characteristics to see whether they were increased among women admitted, indicating an influence, either direct or indirect, on admission rates. Pre-existing medical conditions were considered only in terms of direct influence on admission rates. Six hundred and thirty-one (48.5%) women were admitted antenatally for more than 24 hours on at least one occasion while 671 (51.5%) were never admitted. In almost all respects the groups were remarkably similar and pre-existing risk factors, either in terms of demographic features, past obstetric history or intercurrent medical disease, appeared in this study to contribute minimally to admission rates. The exceptions were a history of a previous perinatal death which statistically increased the chances of antenatal admission by an indirect influence and diabetes mellitus where management invariably included antenatal admission for that specific indication.

Current Pregnancy Complications

Of all the complications recorded, 72% were due to current pregnancy problems; the majority of these were due to a small number of conditions, most of which were also among those complications most commonly resulting in antenatal admission. The 13 conditions of numerical significance in causing antenatal admission in terms of numbers of admissions, numbers of women admitted and numbers of resulting antenatal inpatient days were broadly covered by the four categories of abdominal pain, hypertensive disease, bleeding in pregnancy and suspected intrauterine growth retardation. These four groups of conditions were therefore studied in greater detail.

Abdominal Pain

Four hundred and eighty-eight women in the study group had one or more and in total 757 episodes of abdominal pain; of these, 350 had one or more antenatal admission because of this, such admissions being responsible for almost one-third of the total number of inpatient days for the whole study group. Initially pain was often attributed to labour or to urinary tract infection while in a number of cases no specific diagnosis was proposed. Recurrent pain was a common feature, often with different diagnoses suggested on different occasions. In many cases the initial diagnosis proved unfounded and in only 160 of the 757 episodes of pain was a definite cause identified. Fifty-four women progressed to pre-term delivery while 64 developed one or more episodes of symptomatic and confirmed urinary tract infection. Of the latter, only 11 received treatment which was bacteriologically proven to have eradicated the infection.

The incidence of U.T.I. was increased five-fold among women with asymptomatic bacteriuria but less than a third of the women with bacteriuria developed U.T.I. The association between urinary tract infection, symptomatic or asymptomatic, and increased rates of preterm delivery, low birthweight, hypertension and anaemia in pregnancy is controversial; while the numbers are small, no increase in these rates was observed in this study.

Hypertensive Disease

Two hundred and sixty-two women had a diastolic blood pressure of $\geq$90 mmHg. recorded at least once during their pregnancies; of these 34 had pre-existing hypertension. One hundred and one women were admitted antenatally at least once because of hypertension which was responsible for 11% of the total inpatient days. In many cases hypertension proved non-sustained; in agreement with previously published work the proportion of such cases in this study was higher where the presenting level of hypertension was mild and also rose with increasing gestation at presentation. Appropriately, admission rates rose with increasing severity of hypertension, but, contrary to the established pattern of risk, admission rates were higher the greater the gestation at presentation. This study also confirmed the lack of risk to the fetus of mild or moderate pregnancy hypertension or uncomplicated essential hypertension.

Bleeding

Bleeding was a commonly encountered complication at all stages of pregnancy with 175 women either reporting bleeding on one or more occasions or being diagnosed as having an obstetric condition

with bleeding potential. At all gestations the rates observed in this study were considerably higher than those previously reported; there were no apparent reasons for these differences. One hundred and one women were admitted at least once because of bleeding which was responsible for 13% of the total number of inpatient days. Only women whose pregnancies continued to ≥24 weeks gestation were included in this study; among these women, however, bleeding prior to 24 weeks did not appear to be associated with any marked increase in fetal mortality or morbidity. Among women with bleeding or conditions with bleeding potential at ≥24 weeks gestation, no definite cause could be identified in more than three-quarters of cases. In this group there were increased rates of pre-term delivery, abdominal delivery, and fetal mortality and morbidity; these increased rates were largely among women with placenta praevia or abruptio placentae.

Suspected Intrauterine Growth Retardation

Of the 1302 women in this study, the case records of 85 contained an explicit comment indicating a suspicion of growth retardation. Thirty-four (40%) of these babies did in fact weigh less than the 10th centile for gestation; thus for every two correctly identified small for dates babies there were three false positives. There were in total 129 babies with birthweights below the 10th centile; the antenatal detection rate was therefore 26%. There was a slight but insignificant tendency to identify the smaller babies more frequently. The pick up rate for sick babies was equally low and fetal mortality and morbidity were similar among detected and undetected small babies. The relative risk of a small for dates baby was increased among women

with a past history of such a baby and these women were responsible for 24% of the small for dates babies in the study group. The absolute risk was, however, too low to make this fact of clinical value and the antenatal detection rate in this group was no better than in the study group as a whole.

Conclusions

In this study antenatal admissions largely resulted from complications which arose during the current pregnancy; the majority of these were due to a relatively small number of conditions broadly covered by the four categories of abdominal pain, hypertensive disease, bleeding and suspected intrauterine growth retardation. In all these groups management problems were apparent with difficulties both in diagnosis and in treatment. Inadequacy of available diagnostic methods was often responsible for inconsistencies in management but administrative difficulties also led to problems both in immediate treatment and in follow up.

Antenatal bed requirements are arbitrarily assessed on the basis of calculations relating to current practice. There is, however, inadequate data describing current practice; moreover antenatal admission is used as a therapeutic measure in conditions for which its value is as yet unevaluated. To allow a more rational assessment of future needs, more information on current practices will be required on a wider scale and the value of antenatal inpatient care in the conditions for which it is employed must be evaluated in prospective randomised controlled trials. Finally, objectives of such care must be clearly defined, perhaps with a reappraisal of

the criteria by which benefit is currently assessed.

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Unit No.

Surname

First name

Date of birth

Postcode sector

Woman's occupation .....
(if employed at time of booking)

Husband's occupation .....

Marital state
1 = single, 2 = married, 3 = widowed, 4 = divorced,
5 = separated, 8 = other, 9 = not known

Obstetrician
1 - 8, 9 = N/K

Total pregnancies

Spontaneous abortions

Therapeutic abortions

Caesarean sections

Perinatal deaths

Children now living

Height (cm)

Gestation at booking (completed weeks)

Booking weight (Kg.)

No. of clinic visits : 0-19 weeks

20-27 weeks

28-delivery

Total number of days admissions (antenatal)

Gestation at delivery (completed weeks) ☐☐

Delivery/labour ☐
1 = spont labour, 2 = induction, 3 = c/s not in labour
4 = other, 8 = N/A, 9 = N/K

Duration of labour (hours) ☐☐

Mode of delivery I ☐☐
0 = SVD, 1 = Ceph. abnormal present^{n}/pos^{n} no forceps,
2 = Low forceps no manipulation, 3 = other forceps II ☐☐
4 = vacuum, 5 = Br. spont., ass., unspec.,
6 = Br. extraction, 7 = elective c/s,
8 = other/unspec. c/s, 9 = other/unspec., 10 = N/A

Presentation at commencement of delivery I ☐
1 = occipito-anterior, 2 = occipito-posterior,
3 = occipito-lateral, 4 = breech, 5 = face/brow, II ☐
6 = shoulder, 7 = cord, 8 = other, 9 = N/K

Outcome of pregnancy I ☐
1 = LB, 2 = SB, 3 = LB died <7 days,
4 = LB died 7-28 days, 5 = LB died after 28 days II ☐

Birthweight (gms) I ☐☐☐☐

II ☐☐☐☐

5 min. Apgar I ☐☐

II ☐☐

Sex of infant I ☐
1 = male, 2 = female, 8 = other/- N/K

II ☐

Special nursery I ☐
0 = not admitted, 1 = admitted ≤48 hours,
2 = admitted >48 hours, 9 = N/K II ☐

Baby discharged to I ☐
1 = home, 2 = remaining in SCU,
3 = SCU but home with mother II ☐
4 = other hospital, 5 = other unit in same hospital,
6 = foster home, 7 = local authority care
8 = healthy baby remaining in SCU after mother's discharge
9 = dead

F.A. (state condition) ..... I ☐
1 = yes, 2 = no, 9 = N/K

II ☐

COMPLICATIONS OF PREGNANCY

Complications/Reason for Admission

	Compli-cation	Gestation (completed weeks)	Admission	Dur of adm. (days)	Admitted from	Condition on discharge	Investn of complicn	Complic on discharg
1)	☐☐	☐☐	☐	☐☐☐	☐	☐	☐	☐
2)	☐☐	☐☐	☐	☐☐☐	☐	☐	☐	☐
3)	☐☐	☐☐	☐	☐☐☐	☐	☐	☐	☐
4)	☐☐	☐☐	☐	☐☐☐	☐	☐	☐	☐
5)	☐☐	☐☐	☐	☐☐☐	☐	☐	☐	☐
6)	☐☐	☐☐	☐	☐☐☐	☐	☐	☐	☐
7)	☐☐	☐☐	☐	☐☐☐	☐	☐	☐	☐
8)	☐☐	☐☐	☐	☐☐☐	☐	☐	☐	☐
9)	☐☐	☐☐	☐	☐☐☐	☐	☐	☐	☐
10)	☐☐	☐☐	☐	☐☐☐	☐	☐	☐	☐

No. of admissions .. .. ☐☐

No. compl. treated at home .. .. ☐☐

1) REASONS FOR ADMISSION

PRE-EXISTING PROBLEMS

a) Bad Obstetric History

1 = 1 or 2 first trimester abortions
2 = >2 first trimester abortions
3 = 1 or 2 mid trimester abortions
4 = >2 mid trimester abortions
5 = previous preterm labour (<37 wks)
6 = previous stillbirth
7 = previous neonatal death
8 = previous infertility
9 = previous small for gestational age baby
10 = previous caesarean section

b) Medical Conditions

11 = Diabetes Mellitus (DM) uncomplicated
12 = DM for stablisation
13 = DM complications
14 = DM to await delivery
15 = Suspected cardiac disease
16 = Definite cardiac disease
17 = Hyperthyroid on treatment (℞)
18 = Hyperthyroid no ℞
19 = Hypothyroid on ℞
20 = Hypothyroid no ℞
21 = Epilepsy on ℞
22 = Epilepsy no ℞

COMPLICATIONS OF CURRENT PREGNANCY

a) Hypertension

23 = Pregnancy induced hypertension (PIH) no protein diastolic blood pressure ⩾90⩽95 mmHg
24 = PIH protein DBP ⩾90⩽95 mmHg
25 = PIH no protein DBP >95<110 mmHg
26 = PIH protein DBP >95<110 mmHg
27 = PIH no protein DBP ⩾110 mmHg
28 = PIH protein DBP ⩾110 mmHg
29 = Eclampsia
30 = chronic hypertension

b) Bleeding

31 = Placenta praevia on ultrasound
32 = P. praevia with mild bleeding
33 = P. praevia with severe bleeding
34 = Abruptio mild concealed
35 = Abruptio mild revealed
36 = Abruptio severe concealed
37 = Abruptio severe revealed
38 = Threatened abortion
39 = Inevitable/incomplete abortion
40 = Bleeding ⩾24 wks of undetermined aetiology

c) Spontaneous rupture of membranes (SROM)/preterm labour

41 = SROM not in labour <28 weeks
42 = SROM not in labour 28-32 wks
43 = SROM not in labour 33-37 wks
44 = SROM not in labour >37 wks
45 = Preterm labour <37 wks progressive ±℞/non progressive
46 = Non progressive uterine activity < 37 wks

d) Fetal growth/well being

47 = Low oestriols/HPL (⩾2 readings <10th centile)
48 = Reduced fetal movements
49 = Suspected intrauterine growth retardation
50 = Low weight gain (<0.33kg/wk 20 - 30 wks)
51 = High weight gain (⩾0.55 kg/wk 20-30 wks)

e) Urinary Tract Infection

52 = Asymptomatic bacteriuria
53 = Suspected urinary tract infection (UTI) not confirmed
54 = Confirmed UTI

f) Miscellaneous

55 = Non progressive uterine activity ⩾37 wks gestation
56 = Abdominal pain of undetermined aetiology
57 = Vomiting
58 = Anaemia <10g/100 ml
59 = Acute deep venous thrombosis/ pulmonary embolus
60 = Rhesus isoimmunisation
61 = Twins/multiple pregnancy
62 = Unstable lie
63 = Bed rest - unspecified
64 = Social problems
65 = Hydramnios suspected/definite
66 = Proteinuria
67 = Oedema
68 = To await delivery
69 = Vaginal discharge/infection
70 = Other

2) ADMISSION

1 = yes, 2 = no, 3 = inpatient, 4 = admitted to non-maternity hospital

3) ADMITTED FROM

1 = home, 2 = OPD, 3 = other hospital, 4 = general practitioner
5 = other, 8 = N/A, 9 = N/K

4) CONDITION ON DISCHARGE

1 = still pregnant, 2 = delivered, 8 = N/A, 9 = N/K

5) INVESTIGATION OF COMPLICATION

1 = fetus monitored - normal
2 = fetus monitored - abnormal
3 = fetus not monitored
4 = fetus monitored - not confirmed
5 = mother monitored - normal
6 = mother monitored - abnormal
7 = mother not monitored
8 = mother monitored - not confirmed
9 = both monitored - both abnormal

6) COMPLICATION ON DISCHARGE

1 = settled spontaneously
2 = settled with specific treatment
3 = still present - no treatment
4 = still present after specific treatment
5 = non specific treatment
6 = settled by delivery
9 = not known

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An audit of the detection and management of small-for-gestational age babies

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Summary. The detection and management of small-for-gestational age babies (SGA) was assessed in a case record review of 1302 randomly selected pregnancies. Of the 129 babies with birthweights below the 10th centile for gestational age, 34 (26%) were identified antenatally. For every two correctly identified SGA babies there were three false positive predictions. In-patient monitoring and early elective delivery occurred both in the correctly identified pregnancies (24%) and in the false positives (12%). The management of suspected pregnancies bore no apparent relation to test results and appeared arbitrary. Mortality and morbidity, as measured by nursery admission for >48 h and retention in the nursery after the mother's discharge, were higher in SGA babies than in the hospital population as a whole. The number of ill babies was small, however, reflecting the heterogeneous aetiology of small size for gestational age. Moreover, antenatal detection had little influence on these measures of outcome. It is concluded that tests for detection of SGA babies remain imprecise in practice, gestational weight alone correlates poorly with fetal well-being, and the need remains for sensitive tests to detect babies with genuine morbidity.

Techniques to aid diagnosis and management of common pregnancy complications are often assessed on the results of clinical trials without an audit of their performance in routine practice. While the former approach is necessary to identify the potential of such techniques in an ideal situation, it is the latter approach which indicates the actual practical value.

Many clinical tests have been introduced in an attempt to identify antenatally those babies who are small-for-gestational age, those with a weight for gestational age of less than the 10th centile being traditionally referred to as growth retarded. While many such babies are perfectly normal and healthy, a proportion are truly at risk and the perinatal mortality rate for this group as a whole is higher than for the whole population. Considerable energy has therefore been directed towards the antenatal identification of these babies as constituting an at risk group requiring further investigation.

From an extensive review of the management of antenatal complications in a large maternity hospital (4000 deliveries per annum), this paper reports those results which relate to the detection and management of small-for-gestational age (SGA) babies. The efficiency of detection, including the false positive rate, is evaluated. Subsequent management in suspected pregnancies (both true and false positive) is reviewed and the prevalence of morbidity, the incidence of interventions and the influence of these interventions on fetal outcomes are described.

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Methods

A total of 3928 women were delivered in the Glasgow Royal Maternity Hospital in 1983 of

whom a random third were selected for a comprehensive case record review of antenatal care. A list of 1309 names was generated; the case records of seven women were unavailable. The remaining 1302 women formed the study sample. The case notes were reviewed by one of the authors (M.H.) and details were entered on to a structured computer compatible form. Analysis was by means of the Statistical Package for the Social Sciences (SPSS) on the University of Glasgow's ICL 2988. Statistical analysis was by means of the χ^2 test. The Aberdeen growth curves (Thomson *et al.* 1968) were used to identify the fifth and tenth centiles of fetal weight for gestation.

Results

In the total sample of 1302, there were 129 babies with birthweights below the 10th centile; 34 (26%) were suspected antenatally. Of these 34 pregnancies, 26 were investigated (Fig. 1), but there was no apparent reason for their selection. There was no difference in the occurrence of current pregnancy problems and the incidence of past obstetric problems was marginally higher in the non-investigated group. Of the 26 women who were investigated, 11 had normal results for all tests. Nine of the 11 had no further tests or action (defined as an antenatal admission for further fetal monitoring or elective delivery before 38 completed weeks). The remaining two women were both admitted for further monitoring with subsequent normal results but despite this, one of them was delivered electively at 37 weeks. Fifteen of the 26 investigated women had abnormal or mixed results. In six these abnormal results prompted some kind of action but it was not clear why similar results did not prompt action in the other nine. There was no difference in the birthweight distribution between patients with normal and abnormal results. In all six women where action followed the tests, this initially consisted of an admission for further antenatal monitoring ranging from 5 to 24 days with two women having two admissions. In these six pregnancies inpatient investigations produced abnormal or mixed results. In two, further action was taken in the form of elective delivery at less than 38 completed weeks; these babies were in fact the smallest for gestational age in the group (1750 g at 37 weeks and 710 g at 33 weeks). A further three were delivered electively because of concern about fetal growth but delivery was after 38 weeks.

Ninety-five of the 129 babies with birthweights below the 10th centile were not suspected. Fig. 2 illustrates the centile distribution in the suspected and unsuspected groups. There is a slight tendency to detect the smaller babies more frequently but it is not significant.

As a measure of morbidity, these small babies were classified according to whether they had been admitted to the special care baby unit (SCBU), whether the admission had been for more or less than 48 h, and whether the baby was discharged home with the mother. Table 1 gives the results. Of the 34 suspected and confirmed SGA babies, eight were admitted to the SCBU for >48 h and seven of them were unable to go

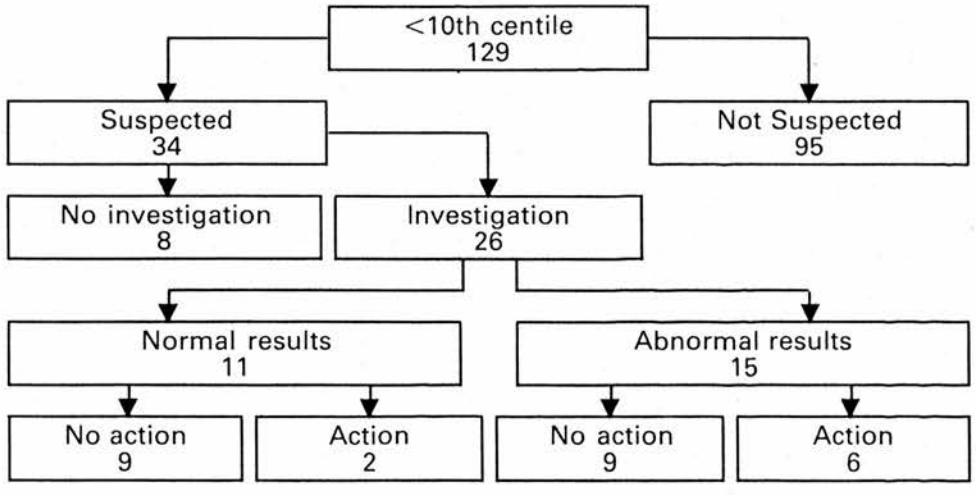

Fig. 1. Small-for-gestational age babies in the sample; management of suspected pregnancies.

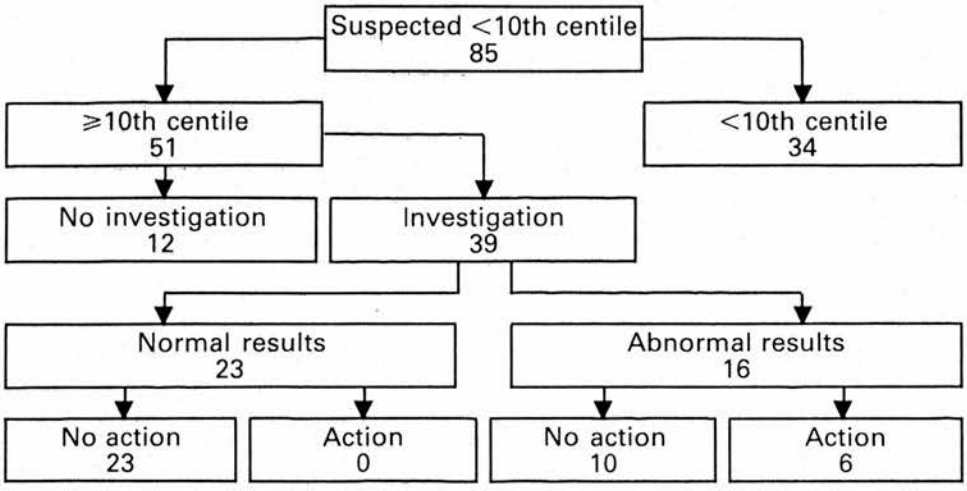

Fig. 3. The numbers and management of babies falsely diagnosed as being of low weight for gestation.

here, although the sensitivity was half that in Aberdeen, ie. 26%, the false positive rate was also halved.

In spite of a continued concern with diagnostic techniques (Lilford *et al.* 1983; Dornan *et al.* 1984), the efficiency of detection remains disappointing. Biochemical screening methods (Aickin *et al.* 1983) have been shown to be of limited value. Even the promising results from a two stage ultrasound programme (Neilson *et al.* 1984), which identified 94% of SGA babies with a specificity of 90%, resulted in 10% of the normal population falsely identified as less than the tenth centile. In our review of clinical practice, the lack of a significant difference in birthweight distribution between suspected and unsuspected pregnancies highlights the lack of precision of available tests. The apparent arbitrary selection of pregnancies for investigation reflects clinical awareness of this fact.

The crude perinatal mortality rate (23·3/1000, based on three deaths) among the 129 babies under the 10th centile was higher than among the hospital population as a whole during 1983 (7·6/1000). All three perinatal deaths occurred in the unsuspected group, although there was an infant death among the suspected babies which was associated with growth retardation. One of the three perinatal deaths was due to Potter's Syndrome, leaving two deaths apparently directly associated with growth retardation. The number of deaths is so small, however, that these figures are of limited significance.

Table 2. detection of ill babies with birthweights below the 10th centile for gestation (SGA)

SGA	Perinatal deaths	SCBU >48 h	Total
Suspected	0	8	8 (32%)
Unsuspected	3	14	17 (68%)
Total	3	22	25 (100%)

SCBU, Special care baby unit.

Morbidity among SGA babies was higher (17% were admitted to the SCBU for >48 h) than for the group as a whole (5%) but there was no significant difference in morbidity between the suspected and unsuspected groups. The pick-up rate of babies with real clinical problems was 32% (Table 2). Thus, although mortality and morbidity are higher in those babies weighing under the 10th centile, only a small minority have clinical problems. While the rate of detection of small babies is low, the rate of pick-up of sick babies is equally low. Finally detection appeared to have little influence on these measures of outcome.

Detection rates can be improved but false positives remain unacceptably high. In our sample, 39 of these 51 false positives had investigations as outpatients and 6 of the 16 with abnormal results were admitted antenatally for from 1 to six weeks. One woman was delivered electively at 35 weeks. This cost of managing the false positives must be considered in any evaluation. It has been recommended (Neilson *et al.* 1984) that greater efficiency would be achieved by not applying screening programmes to low-risk pregnancies. Unfortunately, the accurate